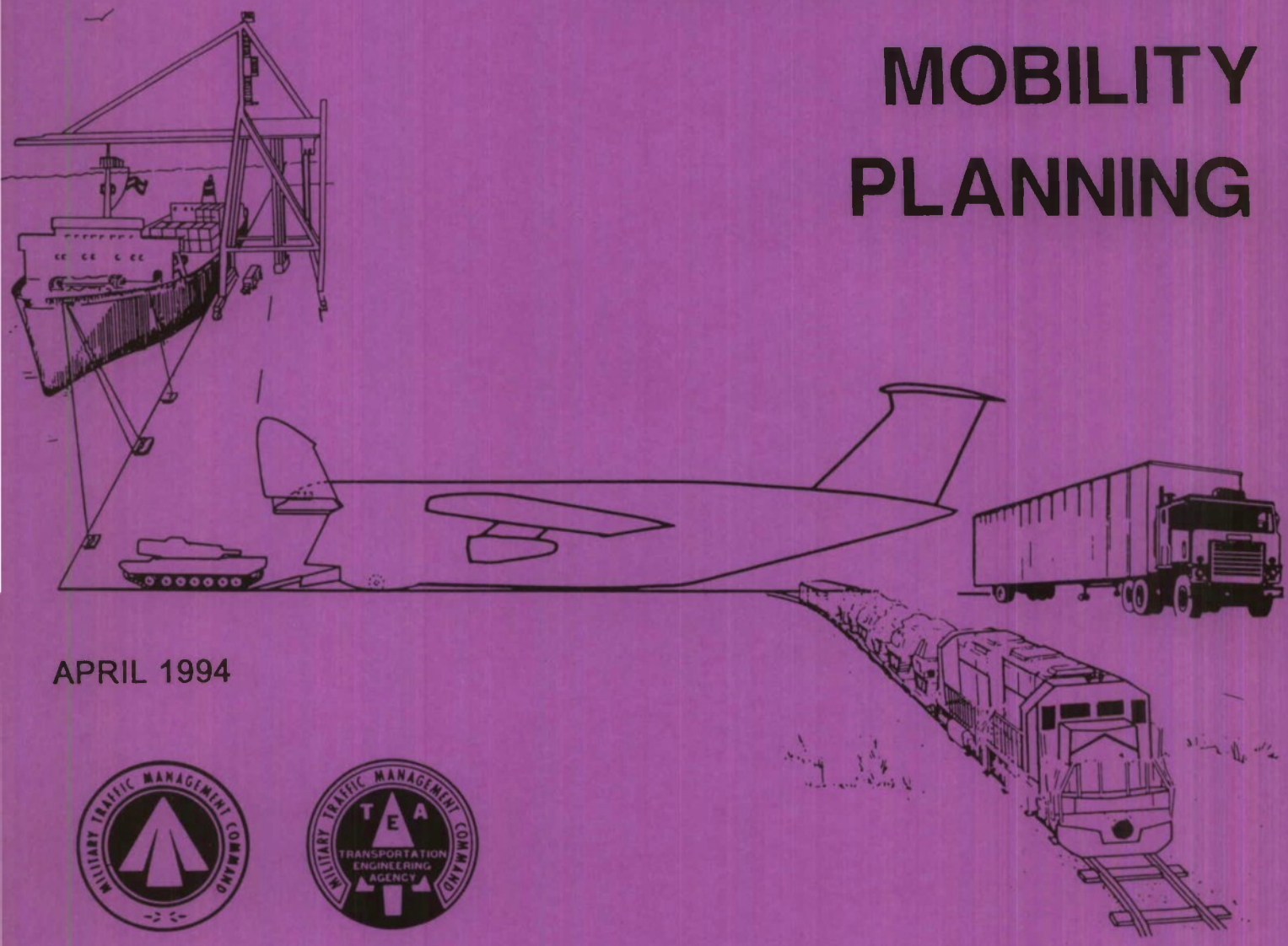
MTMCTEA REFERENCE 94-700-2

LOGISTICS HANDBOOK FOR STRATEGIC MOBILITY PLANNING



APRIL 1994

MILITARY TRAFFIC MANAGEMENT COMMAND
TRANSPORTATION ENGINEERING AGENCY
NEWPORT NEWS, VA

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LOGISTICS HANDBOOK FOR STRATEGIC MOBILITY PLANNING

April 1994

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Newport News, Virginia 23606-2574

*This document supersedes MTMCTEA Reference 92-700-2, September 1992.

FOREWORD

This Reference Guide provides a broad range of vital transport information and guidance for planning purposes. Such data are essential for the successful mobilization, deployment, and sustainment of US Forces worldwide.

The goal of this publication is to standardize transportation information to provide continuity in planning throughout the Joint Deployment Community. It is designed to guide and assist staff and unit officers in planning unit mobilizations and deployments. The information in this publication is not directive in nature and should be used only for planning purposes.

Anyone requiring further assistance or clarification of any transportation-related issue may call MTMCTEA's toll free customer service number: 1-800-722-0727.

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I. INTRODUCTION

A. PURPOSE AND SCOPE

This report provides a broad range of transportation planning data and guidance for mobilizing, deploying, and sustaining US Forces worldwide.

This publication contains the following information:

1. General discussions of mobility planning considerations.

2. Discussions and specific planning guidance for five transportation modes (highway, rail, inland waterways, sea, and air).

3. Unit movement requirements.

4. Containerization discussion and guidance.

5. Supplemental transportation appendixes.

The information in this report is not directive in nature. It should be used only for planning purposes. While more accurate data may exist for each specific application, exercise, or mission being planned, this report can be used in the absence of such data. Also, more definitive data associated with detailed transportation analyses and the shipment of hazardous cargoes are beyond the scope of this report.

B. FORMAT OF TRANSPORT SECTIONS

The format of this report has been arranged to provide continuuity between the five transport sections (highway, rail, inland waterway, sea, and air). Each of these sections contains a discussion of general and background information; inventory of transport assets; discussion of transit data; loading criteria and restrictions; and discussion of unit movement requirements for six Army-type divisions and an armored cavalry regiment (table 1). Some minor deviation may occur from this format per transport mode because of the specific characteristics of that mode. However, for the most part, these sections are uniform in structure.

C. DATA SOURCES

The data in this report are derived from several sources. One major source is the analyses of actual unit moves. Included are unit moves associated with Operation Desert Storm. Other sources of data include historical movement experiences, Joint Chiefs of Staff (JCS)-sponsored exercises, and Military Traffic Management Command Transportation Engineering Agency (MTMCTEA) deployability and transportability studies.

TABLE 1
UNIT CHARACTERISTICS

Unit Type	Number of Personnel	Total Sq Ft	Total STON	Total MTON
Division:				
Air Assault	15,739	1,034,669	35,889	175,682
Airborne	13,149	733,750	24,144	110,691
Armored	17,538	1,538,468	108,708	302,263
Infantry	16,855	1,187,603	66,073	219,806
Light Infantry	10,813	463,939	16,420	73,314
Mechanized	17,776	1,543,868	107,777	303,342
Regiment:				
Armored Cavalry	4,456	439,231	32,976	87,047

Source:
MTMCTEA's Transportability Analysis Reports Generator, using the October 1993 Table of Organization and Equipment and the October 1993 DA standard Equipment Characteristics File.

D. REFERENCES

Source references are provided for the data contained in this report. References for supplemental information can be found in the body of the text and in appendix A. These references should aid the user when information beyond the scope of this publication is required. If the data in this report conflict with the data in the DA or DOD publications, the data in the latter publications take precedence, pending resolution of the conflict. Conflicts should be reported to the Director, MTMCTEA (address below). Also, requests for any MTMCTEA publications named in this report should be sent to MTMCTEA.

E. SUGGESTED IMPROVEMENTS

For improvement of this publication, we encourage user recommendations, comments, and corrections. Address all correspondence to:

Director
Military Traffic Management Command
Transportation Engineering Agency
ATTN: MTTE-OA
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Newport News, VA 23606-2574

The point of contact at this agency is LCDR C. B. Lawrimore, MTTE-OA, AUTOVON 927-5269 or commercial (804) 599-1111. Address electronically transmitted messages to DIRMTMCTEA FT EUSTIS VA//MTTE-OA//.

II. STRATEGIC MOBILITY

A. GENERAL

Strategic mobility is the capability to deploy and sustain military forces worldwide in support of national strategy.

B. RESPONSIBILITIES

The major players in the movement of forces, equipment, and supplies are the US Transportation Command (USTRANSCOM) and its transportation component commands, the Military Traffic Management Command (MTMC), the Military Sealift Command (MSC), and the Air Mobility Command (AMC). Other players include Forces Command (FORSCOM), transportation management officers (TMOs) or installation transportation officers (ITOs), strategic mobility officers (SMOs), defense movement coordinators (DMCs), embarkation officers (EmbOs), and unit movement personnel, including Major US Army Reserve (MUSARC) unit movement coordinators (UMCs).

1. USTRANSCOM

The mission of USTRANSCOM is to provide strategic air, land, and sea transportation for the DOD in times of peace and war. USTRANSCOM is responsible for transportation aspects of worldwide mobility planning, operation of the Joint Operation Planning and Execution System, and centralized global transportation management. Included in global transportation management is the responsibility of the command to support rapid execution planning, deployment, employment, and sustainment of US forces throughout the world. Through the Global Transportation Network, the command also integrates transportation mobility and deployment automated data processing systems into a single information system for all users.

2. MTMC

The mission of MTMC is to meet military transportation needs in peace and war, with emphasis on service, economy, and readiness. MTMC determines how DOD traffic is to move and what control is necessary to assure responsiveness to shippers' requirements. What is to move, where it is to move, and the priority for movement are responsibilities of the DOD shippers and sponsoring commands. As a transportation engineer, MTMC provides scientific, engineering, and transportation expertise to analyze and improve the transportability of military equipment, the deployability of Army units, and the effectiveness of the DOD Transportation Programs for National Defense. As a transportation advisor, MTMC evaluates defense transportation activities and recommends system procedural and engineering improvements to the Office of the Secretary of Defense, Joint Staff, USTRANSCOM, and the Services. As a transportation manager, MTMC manages CONUS freight and passenger traffic, Army passengers worldwide, and the DOD Worldwide Personal Property Movement and Storage Program.

MTMC also provides interface between military shippers, civilian transportation industry, AMC, and MSC. As a transportation operator, MTMC operates ocean terminals throughout the world, with offices at 27 water ports worldwide.

3. MSC

MSC is part of the operating forces of the US Navy. It is also the USTRANSCOM component command for waterborne common-user transportation operations. MSC is responsible for the preparation of employment plans for, and the expansion of, MSC common-user sealift transportation in time of war or national emergency.

4. AMC

The mission of AMC is to provide air transportation for DOD and other Government agencies. Its mission includes aerial deployment by means of airdrop and/or airland for deployment, employment, and redeployment of combat forces and their support equipment; logistical resupply of these forces; aeromedical evacuation; presidential airlift; and aerial refueling.

5. FORSCOM

FORSCOM is the Army's executing agency for mobilization and deployment. Duties include: Develop and publish unit movement planning and execution guidance for use by Army commanders at all levels. Maintain the DA master file of unit movement data (UMD) and standard unit movement reporting procedures for CONUS-based Army units. Maintain the DA master file of standard equipment transportability characteristics for Army tables of organization and equipment (TOE). Provide guidance and assistance to installations and units in UMD maintenance and reporting for mobilization and deployment.

6. TMO/ITO/SMO

TMOs, ITOs, and SMOs provide guidance and assist assigned and supported units in preparing, maintaining, and executing movement plans. They also coordinate and monitor unit movements, provide assistance to units in or traversing the installation support area, and coordinate airlifts. Some of the TMO/ITO/SMO administrative duties include preparing movement reports, processing convoy clearances and special hauling permits, and approving unit movement plans (UMP) and associated data.

7. DMC

The DMCs direct and supervise the preparation, maintenance, and execution of contingency movement plans for mobilization and deployment. DMCs coordinate surface and air movements with DOD elements, serve as the data base manager for the State Highway Network Data Base, analyze military transportation capabilities, and provide compiled data to appropriate agencies.

DMCs also develop procedures for review, validation, and approval of UMP and associated data for National Guard units.

8. EmbOs/Unit Movement Personnel/MUSARC UMCs

EmbOs/unit movement personnel prepare and maintain UMP and standing operating procedures. Their duties also include: reviewing unit plans to ensure they meet requirements, preparing and maintaining documentation needed for unit movement and unit load plans, and coordinating operational and logistical requirements for unit moves. MUSARC UMCs are responsible for approval of UMP for US Army Reserve units.

C. MOVEMENT PLANNING

Commanders in Chief (CINCs) of unified commands develop operation plans and Time-Phased Force and Deployment Data (TPFDD). These data identify units and sustainment to support each OPLAN and provide information concerning routing from origin to destination. USTRANSCOM hosts conferences to match the requirements of the supported CINC with the JCS-allocated strategic mobility resources. Using automated data processing modeling, refinement conferences produce a TPFDD deployment movement plan that is transportation-feasible, based on apportioned forces, strategic airlift, and sealift, and available unit equipment and non-unit supplies.

Movement plans are prepared using reverse planning, which begins with the "ultimate" destination (DEST), the geographic location where the force is to be employed. The required delivery date (RDD) is the date, assigned by the CINC, that the force must arrive and unload at its destination. Figure 1 illustrates the flow of forces/units between their home location to a specified destination in the theater of operations.

For the strategic move, planning begins with the RDD, to determine critical interim dates. The latest arrival date (LAD) is the latest date for the last element of a force to arrive and complete offloading at the port of debarkation (POD). It is determined by subtracting the number of days required to move from the POD to the DEST. The earliest arrival date (EAD) is the earliest date when the first element of a force can be accepted at the POD. The EAD used with the LAD defines a delivery window at the POD for planning purposes.

At the other end of the route, mobilization planners are primarily concerned with preparing and scheduling at the HOME station, mobilization site, and the ORIGIN, which is the beginning point for a deployment move. The ORIGIN and port of embarkation (POE) may, but probably will not be the same geographic location. The ready-to-load date (RLD) is the earliest date a unit is available at the ORIGIN for onward transportation to the POE. The available-to-load date (ALD) is the earliest time that the unit can begin loading at the POE.

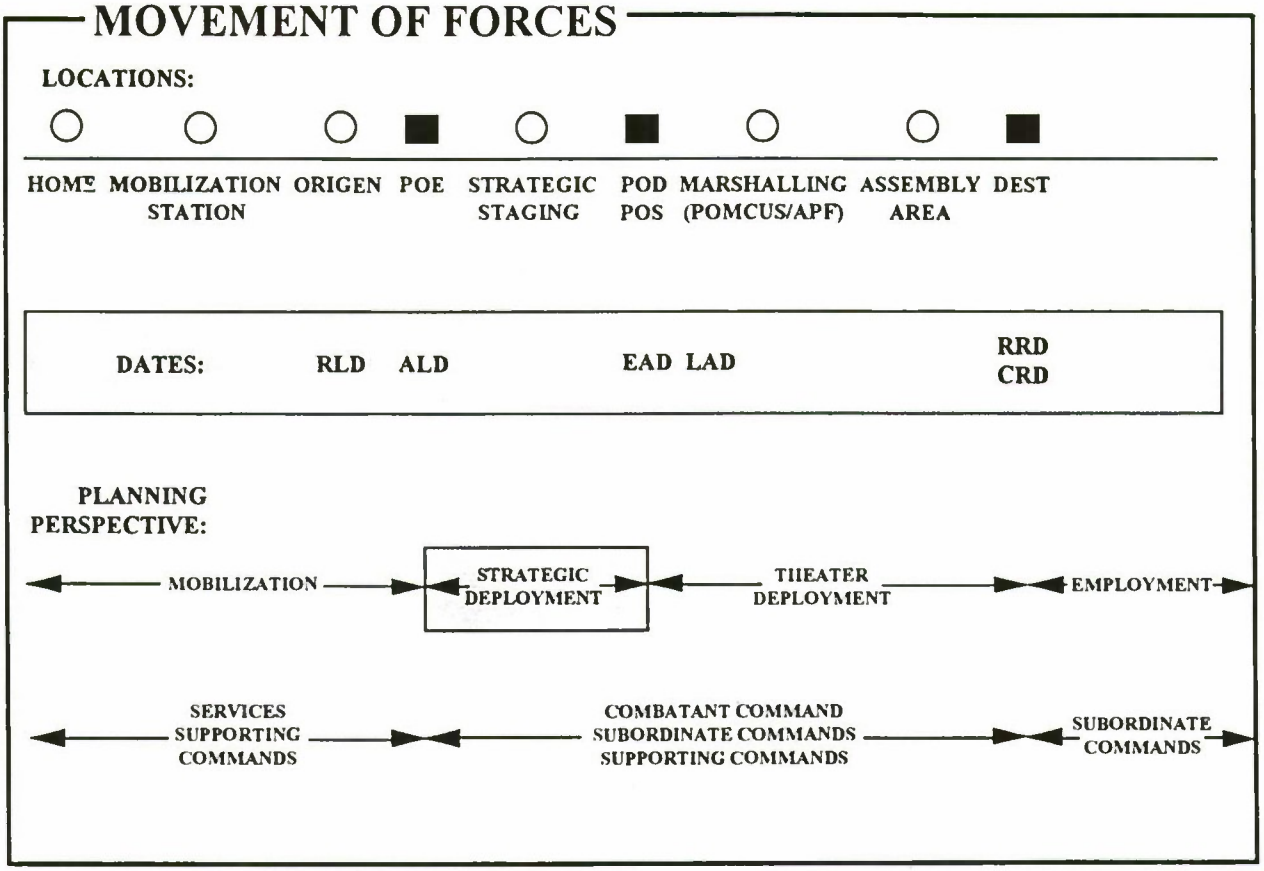


Figure 1. Movement of forces.

The earliest departure date is the earliest date after the ALD that the shipment is ready to depart from the POE. For planning purposes, these dates are calculated backward from the RDD after considering marshaling and assembly times and theater and strategic deployment transportation times. However, in practice there is seldom any flexibility early in the planning period, and planners must calculate the arrival window at the POD by determining the time to complete each link in tactical, intratheater transportation. If the RLD/ALD window given for the ORIGIN/POE is not early enough to meet the arrival window (EAD/LAD) at the POD and the RDD at the DEST, then compromises must be made to ease the impact on the delivery date at the DEST. AFSC Publication 1, The Joint Staff Officers Guide 1993, gives detailed guidance in the area of deployment planning.

Arrival times for the locations shown in figure 1 are assigned by various sources:

1. Ultimate Destination

The ultimate destination and required destination arrival time are selected by the supported commander, based on mission requirements. Actual arrival times will vary with the lift asset availability and movement priorities established by the supported commander.

2. Aerial/Seaport of Debarkation (A/SPOD)

The A/SPOD is selected by the supported commander, and the aerial/seaport of embarkation (A/SPOE) is selected by the supporting commander. The selection of ports in between the A/SPOE and A/SPOD is coordinated with the supported and supporting commanders.

The A/SPOD departure time is calculated by subtracting the expected transit time to the ultimate destination from the RDD. The A/SPOD arrival time is calculated by subtracting the expected offloading, staging, and marshaling times for all cargo from the A/SPOD departure time.

3. Strategic Lift

AMC and MSC select and provide the supported or supporting commander with the required air and sea transportation assets. Section VII and table 26 provide the data necessary to estimate air transit times. Appendix D provides a mileage guide with distances between ports and an estimate of ship speeds to calculate transit time between CONUS SPOEs and overseas SPODs.

4. A/SPOE

AMC, in conjunction with the component forces and supported CINC, recommends the APOE for all airlifts it performs. TRANSCOM will make the final decision concerning APOE selection.

MTMC, in coordination with MSC, recommends the SPOE for all CONUS ocean terminals (commercial and military), based on the RDD of the supported/supporting commander, vessel transit time, estimated load time, and port/berth availability. Cargo arrival times at SPOEs are mandated by MTMC in the port call.

A/SPOEs are selected based on the mission, port capabilities and location, characteristics and availability of the aircraft/ship, cargo type, and hostile threat assessment.

A/SPOE departure times are requested by the supported commander, but ultimately are selected by AMC for airlift and MSC for sealift. The only exception is that the supported or supporting commander may sometimes select the departure times, where appropriate. The departure time can normally be estimated by subtracting the air or surface overseas transit time from the scheduled-to-arrive date at the intermediate location or A/SPOD, as applicable.

The A/SPOE arrival times are selected by MTMC. The times are based on lift asset availability and the estimated aircraft or ship departure times. The arrival time is calculated by subtracting the time required to process and load vehicles and equipment from the air or ship departure time. Vehicle and equipment processing at the A/SPOE may require vehicle reduction, defueling, maintenance, washing, documentation, marking, weighing, and staging. Standard planning times for arrival at the APOE prior to takeoff are 6 hours for cargo and 3 hours for passengers.

5. Mobilization Station

Units are often assigned a permanent mobilization station. When a CONUS-based unit is not permanently assigned to a CONUS installation (as is the case with some Reserve units), the unit deploys through a mobilization station selected by FORSCOM. This selection is based on the mission, station capabilities, transportation assets, unit requirements, and location.

The mobilization station departure time is selected by the supported or supporting commander. It can be estimated by subtracting the land transport time to the A/SPOE from the A/SPOE arrival time. Appendix C lists the surface mileage between major US Army installations and major US ports. Appendix E lists the surface mileage between major US Army installations and major US APOEs. For units convoying to an A/SPOE, the mobilization station departure time calculation should include estimates of anticipated time spent in FORSCOM marshaling areas.

The mobilization station arrival time, for units not permanently assigned to that station, is selected by the supported or supporting commander. It can be estimated by subtracting the processing time from the mobilization station departure time. The processing time should include the time required to receive railcars/commercial trucks and the time to load them, as applicable.

6. Origin Station

The origin station departure time is also selected by the supported or supporting commander. It can be estimated by subtracting the transit time to the A/SPOE from the A/SPOE arrival time.

III. MODE SELECTION FOR CONUS MOVEMENTS

A. GENERAL

This section provides general planning criteria for selecting the mode and method of transport for passengers, unit equipment, and resupply cargo in CONUS. For resupply cargo, transportation options associated with each supply class are listed. Additional information for CONUS movements can be found in AR 55-355.

B. CONUS MOVEMENT OF PASSENGERS

Mode selection (for CONUS passenger movements) should reflect the most economical means that meet DOD operational requirements. As in all movements, the mission may dictate deviation from the mode selection criteria outlined in this section. MTMC will determine the commercial carrier equipment to be used. MTMC retains routing authority in some instances and delegates the authority to local ITOs or division transportation officers (DTOs) in other instances. Table 2 lists the routing authority criteria for CONUS movement of passengers.

TABLE 2
ROUTING AUTHORITY FOR CONUS MOVEMENT OF PASSENGERS

Routing Authority	Number of Passengers per Mode		
	Rail	Bus	Air
(450 mi or less)			
MTMC	None	None	21 or more
ITO	Any number	Any number	20 or less
(451 mi or more)			
MTMC	21 or more	21 or more	21 or more
ITO	20 or less	20 or less	20 or less

Source:
AR 55-355, ch 306, 31 Jul 86.

CONUS transport of passengers is by bus, rail, emergency military transportation, commercial air, chartered commercial aircraft, or chartered airtaxi. No noteworthy physical limitations exist for passenger movements on these conveyances, other than passenger quantity and baggage limits. Consult AR

55-355, chapter 47, for additional information on passenger movements.

C. CONUS MOVEMENT OF UNIT EQUIPMENT

DA policy (FORSCOM Regulation 55-1, Unit Movement Planning) requires the maximum use of commercial lift capabilities in CONUS for unit deployments involving movement of unit equipment. Maximum use of these capabilities will reduce wear and tear on tactical wheeled vehicles, minimize requirements for en route support, and reduce maintenance requirements at marshaling areas. The supporting ITO, DTO, SMO, or EmbO must notify MTMC of the departure times of cargo/equipment leaving the installation and of the estimated time of arrival for cargo/equipment reaching the SPOE/APOE. Total unit equipment weighing less than 10,000 pounds will be routed by the ITO, DTO, SMO, and EmbO. Equipment weighing more than 10,000 pounds will be routed by the MTMC area command. AR 55-335 provides guidance on routing requests. FM 55-65 provides guidance on movement to, and operations at, the SPOE.

Mode selection for CONUS unit equipment movements should reflect time constraints, economic requirements, asset availability, hostile threat assessment, and special movement requirements. The mission may dictate deviations from the mode selection criteria outlined in this section. MTMC will determine the transport mode for commercial movements, except as delegated to the ITOs, DTOs, SMOs, and EmbOs.

Transport options for CONUS movement of unit equipment include highway, rail, and inland waterways. Inland waterways are an option worth considering. Although no formal guidance for inland waterways exists, in recent years successful unit moves have been made via this transport system (see sec IX). Air transport within CONUS is unlikely for any significant quantities of unit equipment. Helicopters normally are expected to self-deploy to the APOE/SPOE for transport by airlift or sealift. For helicopter delivery procedures, see the US Army Aviation Systems Command Report, US Army Aircraft Delivery Procedures (Instructions for Delivery Pilots), October 1987.

The general guidance for the use of commercial transport (motor and rail) of unit equipment in CONUS is as follows:

1. Commercial transport assets will be used in CONUS for moving unit equipment during mobilization and deployment.

2. Commercial assets must be available to support the nonorganic move and to satisfy the RDD.

3. The commercial movement capability must be validated by MTMC, and the commercial movement must be approved by the authorized level of command.

Exceptions to this guidance, contained in FORSCOM Regulation 55-1, are units located within a 1-day road march (400 miles) to the mobilization station or POE. These units can move over the road organically when the unit commander determines that such a movement will not adversely affect equipment readiness and adequate en route support is available.

The transport mode selected must meet the physical dimensions and weight requirements of the cargo to be moved. Consult sections IV through VII and IX for details pertaining to each transport mode.

Special consideration should be given to determine when/if State permits are required for a specific CONUS unit movement. Depending on the dimensions and weight of equipment to be transported, obtaining a State permit could require significant coordination with State transportation officials. See FORSCOM Regulation 55-1 for specific guidance in obtaining permits.

D. CONUS MOVEMENT OF RESUPPLY CARGO

Mode selection for CONUS movement of resupply cargo (by definition this includes ammunition and major end items of unit equipment) in significant quantities should reflect consideration of economic factors, RDD, asset availability, hostile threat assessment, and specific movement requirements.

The mission may dictate deviations from the mode selection criteria outlined in this section. Resupply cargoes should be containerized to the maximum degree, to take advantage of commercial container transport and intermodal systems (trucks, containers on flatcars, and containerships). Both 20-foot and 40-foot containers would be used. For planning purposes 20-foot containers will be used for ammunition. However, both 20-foot and 40-foot containers will be used for all other classes of supply. Experience has shown that the average short tons (STON) per container are: 6 STON per 20-foot container and 12 STON per 40-foot container for unit equipment, 10 STON per 20-foot container and 20 STON per 40-foot container for resupply except ammunition, and 15 STON per 20-foot container for ammunition. Table 3 lists the resupply mode selection criteria MTMC uses to determine the transport modes.

TABLE 3
RESUPPLY MODE SELECTION AND LOADING CRITERIA

Supply Class / Subclass	STON per Vehicle					Mileage					
	Motor[1]	Rail				0 to 400		401 to 800		More than 800	
		Boxcar	Flatcar	Reefer	Tank Car	STON	Mode	STON	MODE	STON	Mode
1. Subsistence	18	34	0	0	0	All	Motor	0-24 >24	Motor Rail	0-12 >12	Motor Rail
Refrigerated	15	0	0	20	0	All	Motor	0-24 >24	Motor Rail	0-12 >12	Motor Rail
2. General Support Items	17	30	20	0	0	All	Motor	0-24 >24	Motor Rail	0-12 >12	Motor Rail
3. POL											
Bulk	24	0	0	0	66	All	Motor	All	Motor	All	Rail
Packaged	22	24	25	20	0	All	Motor	0-24 >24	Motor Rail	0-12 >12	Motor Rail
4. Construction Materials	17	32	20	0	0	All	Motor	0-24 >24	Motor Rail	0-12 >12	Motor Rail
5. Ammunition	24	60	0	0	0	All	Motor	0-24 >24	Motor Rail	0-12 >12	Motor Rail
6. Personal Demand	16	30	24	0	0	All	Motor	0-24 >24	Motor Rail	0-12 >12	Motor Rail

TABLE 3 - cont

Supply Class / Subclass	STON per Vehicle: Motor[1]	Rail: Boxcar	Flatcar	Reefer	Tank Car	Mileage: 0 to 400 STON	0 to 400 Mode	401 to 800 STON	401 to 800 MODE	More than 800 STON	More than 800 Mode
7. Major End Items	16	30	20	0	0	All	Motor	0-240 >240	Motor Rail	0-48 >48	Motor Rail
Administrative/ General Support Vehicles	12	0	12	0	0	All	Motor	0-48 >48	Motor Rail	All	Rail
Tactical/Special-Purpose Vehicles	0	0	50/100[2]	0	0	All	Rail	All	Rail	All	Rail
Missiles	10	0	18	0	0	All	Motor	0-10 >10	Motor Rail	All	Rail
8. Medical Material	15	30	24	0	0	All	Motor	0-24 >24	Motor Rail	0-12 >12	Motor Rail
9. Repair Parts	16	30	20	0	0	All	Motor	0-240 >240	Motor Rail	0-48 >48	Motor Rail
Ground Support Materials	16	30	20	0	0	All	Motor	0-240 >240	Motor Rail	0-48 >48	Motor Rail
10. Materials to Support Nonmilitary Programs	16	30	20	0	0	All	Motor	0-240 >240	Motor Rail	0-48 >48	Motor Rail

[1]Motor, as used in this table, is defined as a tractor-trailer truck and 40-ft flatbed trailer. When containers are used to transport various supply classes above, it should be noted that the weight of the containers (approx 3 STON per 20-ft and 6 STON per 40-ft container) is included in the STONs shown.

[2]50 STON per commercial railcar or 100 STON per DFRIF railcar.

IV. HIGHWAY TRANSPORT

A. GENERAL

This section provides transport planning data for CONUS highway movement of unit equipment and military cargo. It discusses background information pertaining to military convoys, motor transport types and selection criteria, commercial transit data, State highway limits and restrictions, and unit movement requirements. Also provided at the end of this section is a discussion of transporting personnel by commercial bus.

B. BACKGROUND

1. Highway Transport Sources

Sources of highway transport assets include commercial carriers with equipment for lease or hire and organic assets of the mobilizing unit.

2. Commercial Transport

For units more than a 1-day road march (400 miles) from the mobilization station or POE, the standard practice of the Army is to maximize the use of commercial transport (rail, motor, or barge) capabilities in CONUS, to reduce wear and tear on tactical wheeled vehicles, minimize requirements for en route support, and reduce maintenance requirements at marshaling points. However, at times when situations exist where this is not practical or feasible, a unit must move by way of a military convoy.

3. Military Convoys

Roadable vehicles of units within a 1-day (400 miles) road march to the mobilization station or A/SPOE will move via organic mode. Roadable vehicles are those wheeled (not tracked) vehicles that can be driven or towed on the nation's highways. Exceptions will be made to this policy when, in the opinion of the commander, organic movement would adversely affect equipment readiness or en route support would be inadequate to support an organic movement. See FORSCOM Regulation 55-1 for specific guidance on road march authorization. Commercial assets must still be available to support the movement of any nonroadable equipment.

4. Military Convoy Planning

To improve planning and coordination of Active and Reserve unit moves to mobilization stations and A/SPOEs, MTMC, in coordination with FORSCOM, developed a mobilization movement control (MOBCON) program. The program is currently being implemented by FORSCOM and the National Guard Bureau.

Under the concept, a Defense Movement Coordinator (DMC) has been established for each State. DMCs will assemble, analyze, and coordinate movement plans for all moves that originate in their State and will assist in coordinating moves that originate elsewhere and traverse that State. The DMC will establish master movement files for each State, obtain State clearances based on the master files, execute master movement plans, monitor and coordinate moves, resolve problems, and reroute moves as necessary. DMCs and their State highway civilian counterparts are listed in the MTMCTEA Report, Directory of Highway Permit Officials and Mobilization Movement Control (MOBCON) Coordinators, November 1993.

Detailed military convoy information can be found in FORSCOM Regulation 55-1, AR 55-29, AR 55-162, FM 55-30, and FM 55-312. Military convoy routing information can be obtained from MTMCTEA Reports SE 89-4b-59, Strategic Highway Corridor Network (STRAHNET) Connector Atlas, September 1991, and SE 89-4b-27, Strategic Highway Corridor Network, January 1991. Figure 2 shows the current STRAHNET.

C. TRANSPORT ASSETS

1. Motor Transport Types

The selection of military or commercial motor transport assets for a unit move is based upon the size and weight limitations of the cargo. The criteria below should be used to select the best type of motor transport:

a. Motor Van. Motor vans are the highway assets for items not more than 472 inches long, 90 inches wide, 84 inches high, and 10,000 pounds (excluding any wheeled or tracked vehicles).

b. Containers. The criteria for containers are somewhat more restrictive. For the container, items should not exceed 85 inches wide by 80 inches high by 460 inches long, and 10,000 pounds (excluding vehicles). See section VIII for specific guidance.

c. Flatbed Semitrailer. The flatbed semitrailer, commercial or military, is the highway asset for items that exceed the motor van or container criteria but do not exceed 474 inches in length, 102 inches in width, 116 inches in height, and 40,000 pounds. Widths greater than 102 inches, the legal limit IAW Code of Federal Regulations/Title 49, must be granted a permit.

d. Lowbed Trailer. The lowbed trailer, commercial and military, is the highway asset for items that exceed the flatbed semitrailer criteria but do not exceed 474 inches in length, 144 inches in width, 128 inches in height, and 52,000 pounds.

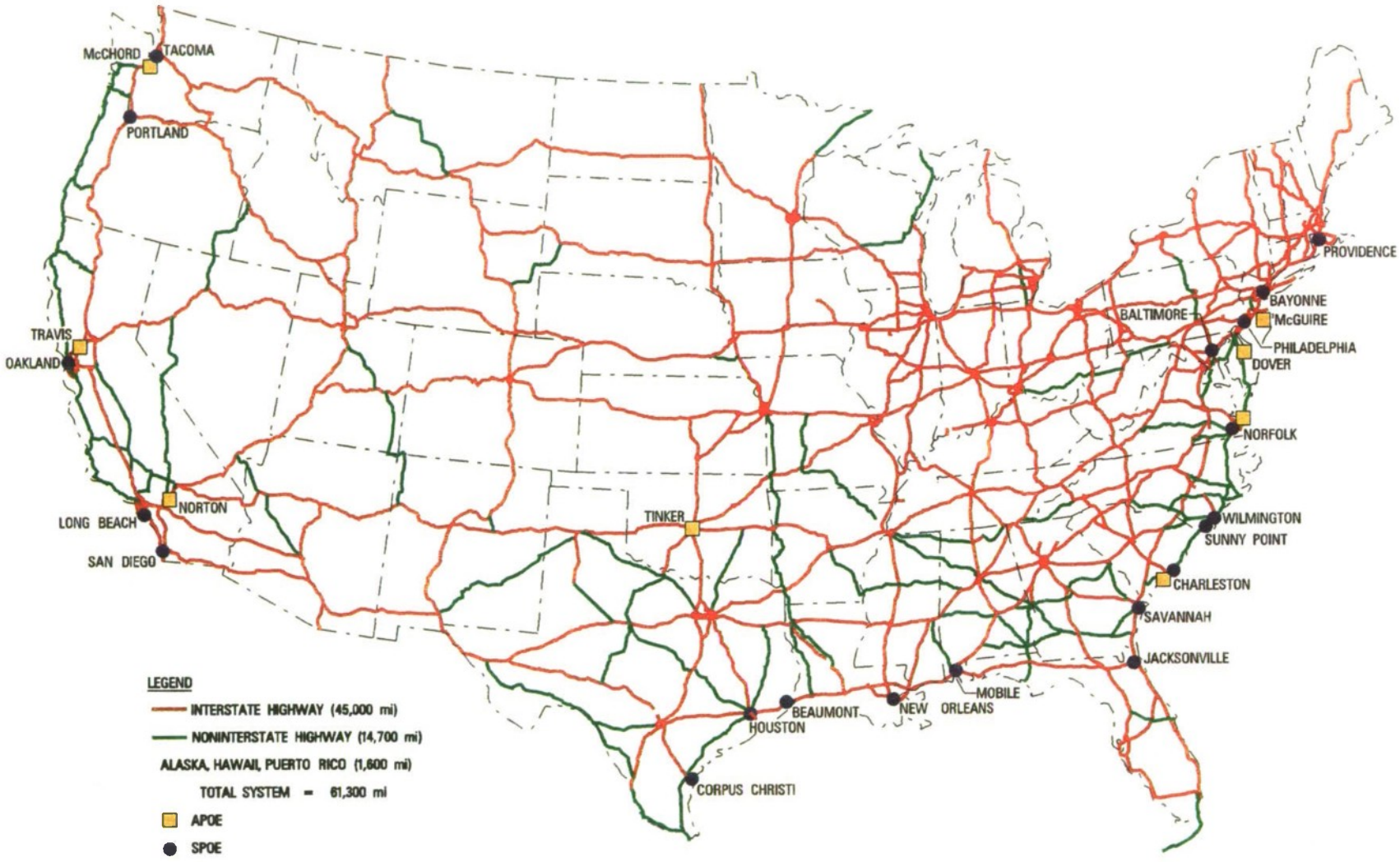


Figure 2. Strategic Highway Corridor Network (STRAHNET) - August 1993

e. Heavy-Equipment Transporter (HET) System. The Army's HET, or a commercial equivalent, is the highway asset for items up to 70 tons. MTMC does not plan for the use of military HETs in CONUS during a mobilization and deployment because the size and weight of the combinations possible with this system and its cargo generally exceed the limits for State highway permits.

2. Motor Transport Inventories

It can be assumed that commercial motor transport assets are of sufficient quantities that an inventory listing is not necessary.

D. TRANSIT DATA

1. Military Convoy Speeds

The maximum speed for military vehicles convoying on interstate highways or expressways is 50 miles per hour (mph). Military vehicles moving on controlled access highways will maintain the minimum posted speed, or 40 mph if a minimum speed is not posted. Military vehicles that cannot maintain the minimum posted speed must be routed over an alternate, noncontrolled access route.

2. Military Convoy Transit Times

For general planning purposes, military vehicles convoying on controlled access highways are programmed to average 400 miles per day, calculated on a roadtime of 10 hours a day. FM 55-30 dictates a 10-minute rest stop every 2 hours and a 1-hour refueling and lunch period.

3. Commercial Truckload

Commercial motor truckload service is planned to average 46 mph for a distance of 1,000 miles per day (using two drivers per prime mover). A truckload is defined as the quantity of freight that will fill a truck, the quantity of freight weighing the maximum legal amount for a particular truck, or, when used in connection with freight rates, the quantity of freight necessary to qualify a shipment for a truckload rate. The Interstate Commerce Commission (ICC) considers a truckload as any shipment of 10,000 pounds or more.

E. STATE HIGHWAY LIMITS

Two principal sets of State highway limits exist. These include limits that apply to routes on the national network and routes that are not on the national network.

1. Routes on the National Network

This network of routes (for longer, wider trucks), established as a result of the 1982 Surface Transportation Assistance Act, consists of the interstate highway system and about 140,000 miles of other Federal-aid highways. The dimensions and weight restrictions established by the act are as follows:

a. Length: no less than 48 feet and up to 60 feet for semitrailers (varies by State); 28 feet for each trailer in a double-trailer combination.

b. Width: 102 inches.

c. Height: 13 feet 6 inches.

d. Weight: 20,000 pounds for single axles; 34,000 pounds for tandem axles; and up to 80,000 pounds for gross vehicle weight (calculated by bridge gross weight formula).

2. Routes Not on the National Network

These routes are subject to dimension and weight restrictions imposed by the individual States. The restrictions vary from State to State. However, the following data can be used as a general guideline:

a. Length: tractor-semitrailer, 55 feet; truck, 35 feet.

b. Width: 96 inches.

c. Height: 13 feet 6 inches.

d. Weight: same as for national network routes.

These are the legal limits for movement of military-sponsored cargo without a permit. Since actual limits vary from State to State, the limits shown are for planning purposes only. Specific limits and permits may be obtained by contacting the appropriate State highway departments. State points of contact are identified in the Directory of Highway Permit Officials and Mobilization Movement Control (MOBCON) Coordinators, which is prepared and distributed by MTMCTEA. The directory also contains State-by-State summaries of legal and maximum permissible limits. Larger and heavier loads are commonly moved by permit under the provisions of AR 55-355, chapter 28, and AR 55-162.

F. UNIT MOVEMENT REQUIREMENTS

Table 4 lists the CONUS highway transport requirements (convoy/motor) for six Army-type divisions and an armored cavalry regiment.

TABLE 4
CONUS UNIT MOVEMENT REQUIREMENTS - CONVOY/MOTOR

Unit Type	Motor Transport Type	Number of Vehicles Driven	Number of Vehicles Towed	Number of 20-ft Containers	Rail Flatcars	
	40-ft Flatbed				60-ft	68-ft
Division:						
Air Assault	762	3,480	2,111	646	4	-
Airborne	887	2,651	1,607	841	4	-
Armored	658	3,791	2,457	400	478	257
Infantry	479	3,818	2,274	404	264	94
Light Infantry	306	1,906	1,283	411	6	-
Mechanized	669	3,812	2,494	395	508	228
Regiment:						
Armored Cavalry	193	906	535	96	138	88

Note:
The containers in this table are simulated as loaded on the 40-ft flatbeds (2 per truck). CONUS movement by convoy/motor requires the combined use of motor transport assets and convoy transport of towed and driven vehicles. Rail assets are required to move outsized equipment.

Source:
MTMCTEA's Transportability Analysis Reports Gernerator, using the October 1993 Table of Organization and Equipment and the October 1993 DA standard Equipment Configuration File.

It also lists the number of 60-foot commercial and 68-foot DODX flatcars required to move equipment not meeting highway transporter weight and dimensional criteria. Table 5 lists the probable OCONUS highway transport requirements (convoy/motor) for the same seven Army-type units.

G. COMMERCIAL BUS

1. Routing Authority

The authority to route passengers by commercial bus is outlined in table 2. For more detailed information on commercial bus service, refer to AR 55-355.

2. Loading Criteria

Commercial buses can be used for movement requirements when it is determined that their use is mission essential. Commercial bus travel is planned to average 50 mph for 18 hours, for a total of 900 miles per day. The average commercial busload is 43 passengers per bus.

TABLE 5
OCONUS UNIT MOVEMENT REQUIREMENTS - CONVOY/MOTOR

Unit Type	Motor Transport Type		Number of Vehicles Driven	Number of Vehicles Towed	Number of 20-ft Containers
	40-ft Flatbed	HET			
Division:					
Air Assault	764	4	3,480	2,111	646
Airborne	887	6	2,651	1,607	841
Armored	700	1232	3,791	2,457	400
Infantry	519	553	3,818	2,274	404
Light Infantry	307	8	1,906	1,283	411
Mechanized	712	1234	3,812	2,494	395
Regiment:					
Armored Cavalry	214	387	906	535	96

Note:
The containers in this table are simulated as loaded on the 40-ft flatbeds (2 per truck). OCONUS movement by convoy/motor requires the combined use of motor transport assets and Convoy moement of towed and driven vehicles.

Legend:
HET - Heavy-equipment transporters

Source:
MIMCTEA's Transportability Analysis Reports Generator, using the October 1993 Table of Organization and Equipment and the October 1993 DA standard Equipment Configuration File.

V. RAIL TRANSPORT

A. GENERAL

This section provides transport planning data for rail movements of CONUS-based forces. Only rail transport assets that are militarily useful for the mobilization and deployment of forces from installations to SPOEs will be examined. This section includes a summary of commercial rail assets, the Defense Freight Railway Interchange Fleet (DFRIF) inventory, and rail deployment planning data.

B. BACKGROUND

Sources of rail transport assets include commercially-owned and operated railcars and MTMC-owned DODX railcars. The DODX cars make up the DFRIF.

The main purpose of the DFRIF is to supplement commercial railcar capability, where:

1. Commercial railcars are not available in the quantities or at the time required.

2. A requirement exists for a specialized car type that is not available from commercial rail sources.

C. TRANSPORT ASSETS

1. Railcar Types - Desert Storm

About 95 percent of the railcars used in the CONUS rail deployment of unit equipment during Desert Storm were standard and multilevel flatcars. Of these flatcars, 98 percent were the chain-tiedown type. However, it should be noted that the demand for railcars at any one time was limited by the ships available at the ports. With the anticipated increase in sealift ships, railcar demand will also increase, which may decrease the percentage of chain-tiedown cars that are used. For detailed information concerning rail deployments during Desert Storm, see MTMCTEA Report OA 91-4a-26, Rail Deployment at CONUS Installations - Operation Desert Storm, July 1992.

2. Commercial Rail Inventory

An inventory of militarily useful commercial railcars can be extracted from the Universal Machine Language Equipment Register (UMLER) railcar data base. UMLER lists railcar characteristics and quantities. For the analytical purposes of this section, the commercial railcar types used were the 89-foot flatcar and the 60-foot flatcar.

3. DFRIF Inventory

Currently, the only DFRIF railcars available for mobilization purposes are 68-foot heavy-capacity flatcars (see table 6). Funding for additional medium-capacity DFRIF flatcars is available for FY 94 procurement (see table 6 for planned procurement). An unspecified number of additional medium-capacity flatcars is also slated for FY 95 procurement. DFRIF heavy-capacity flatcars are the chief means of transporting the main battle tanks (M60A3 and M1 series) and similar equipment from military installations to SPOEs. The new medium-capacity DFRIF flatcars, with a 100 STON capacity, can also transport the M60A3- and M1-series battle tank. Other equipment not requiring heavy-capacity flatcars may also use the DFRIF heavy-capacity cars, with the permission of the car manager.

TABLE 6
DEFENSE FREIGHT RAILWAY INTERCHANGE FLEET
(DFRIF) RAILCAR INVENTORY AND CHARACTERISTICS

Type	Capacity (STON)	Length (ft)	Width (ft-in.)	Quantity
Current Inventory:				
Flatcar	140	68	10-5	566
FY 94 Procurement:				
Flatcar	100	68	10-5	93
Flatcar	100	89	10-5	94

D. TRANSIT DATA

The criteria below are provided to assist in selecting the appropriate method of rail transport:

1. Unit Equipment Trains

Unit equipment railcars will normally move as a unit train. The number of railcars in a unit equipment train varies. Regardless of the number of railcars, all unit trains are planned to average 22 mph, for a distance of 528 miles per day.

2. Carload (CL) Shipments

CL shipments totaling 49 or fewer railcars will normally move in regular train service at an average speed of 13 mph, for a distance of 312 miles per day.

3. Envelope Restrictions on CONUS and Foreign Rail Systems

For generally unrestricted movement in North America, the height and width of a loaded railcar shall remain within the limitations of the American Association of Railroads (AAR) Outline Diagram for Single Loads, Without End Overhang, on Open-Top Cars. This diagram is shown in figure 3. A loaded railcar meeting the confines of this diagram will be capable of unrestricted transport in North America, except on a very few rail lines considered unimportant for DOD use. All loads exceeding any of the AAR outline diagram criteria are considered "dimensional loads" and must receive clearance approval from involved railroad companies prior to commencement of the move. The DOD clearance diagram established dimensional criteria for moving dimensional loads over a network of strategically important rail lines. Similar rail limitation criteria exist for various foreign rail systems. For a detailed description of the AAR outline diagram and other rail limitation criteria, refer to MIL-STD-1366C, paragraph 5.2. Figure 4 shows the existing Strategic Rail Corridor Network and connector lines from various military installations.

E. UNIT MOVEMENT REQUIREMENTS

Railcar requirements for the movement of the six Army-type divisions and an armored cavalry regiment are shown in table 7. Table 8 lists a convoy/rail option for the same Army-type units.

For specific railcar loading guidance see TM 55-2200-001-12 and MTMCTEA Pamphlet 55-19, Tiedown Handbook For Rail Movements, June 1991.

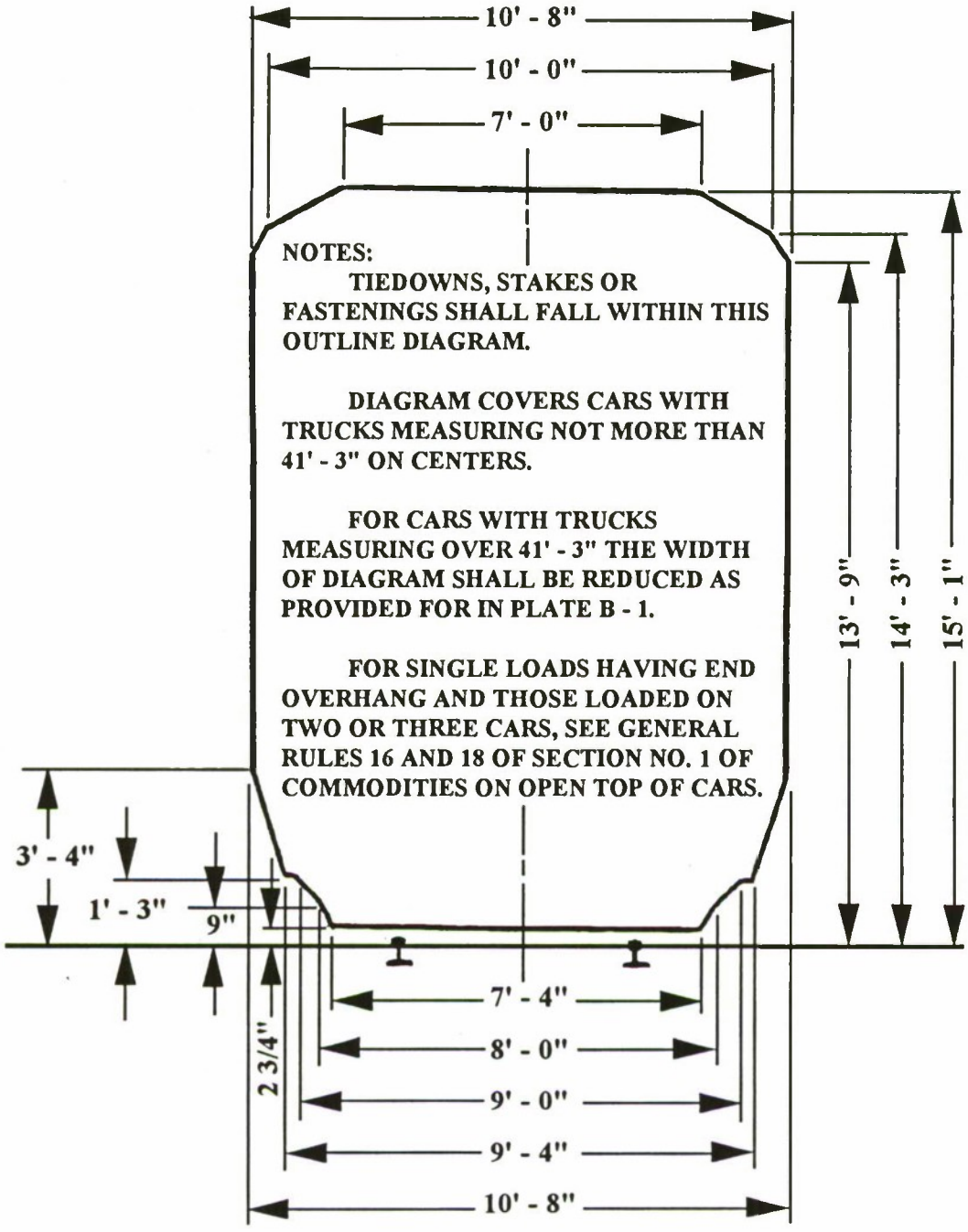


Figure 3. AAR outline for single loads, without end overhang, on open-top cars.

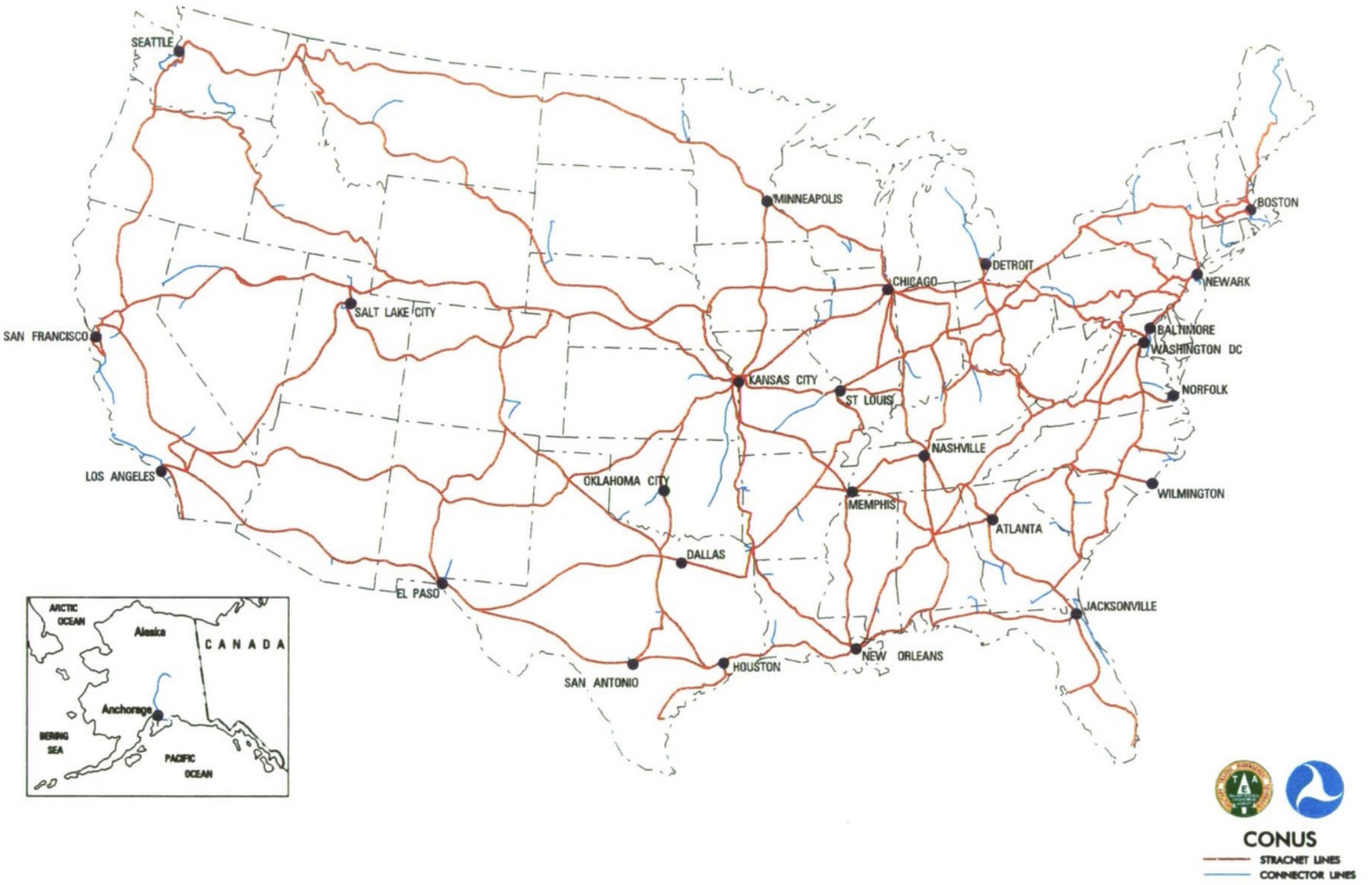


Figure 4. Civil rail lines important to national defense.

TABLE 7
UNIT MOVEMENT REQUIREMENTS - RAIL

Unit Type	Rail Flatcar Type			Number of 20-ft Containers
	89-ft[1]	60-ft	68-ft DODX	
Division:				
Air Assault	1,622	19	-	646
Airborne	1,305	15	-	841
Armored[2]	1,921	479	281	400
Infantry[3]	1,714	277	100	404
Light Infantry	837	14	-	411
Mechanized[2]	1,937	509	252	395
Regiment:				
Armored Cavalry[2]	482	142	94	96

[1]The containers in this table are simulated as loaded on the 89-foot flatcars.
[2]These three units contain LIN-Z10988 (Bridge Hvy Assault) in various quantities. This equipment is considered outsized for any of the transporters above.
[3]This unit contains LIN-C20414 (Bridge Arm Veh LCH) considered to be outsized for any of the transporters above.

Source:
MTMCTEA's Transportability Analysis Reports Generator, using the October 1993 Table of Organization and Equipment and the October 1993 DA standard Equipment Configuration File.

Note:
Unit movement by rail requires all assets shown for a particular unit.

TABLE 8
UNIT MOVEMENT REQUIREMENTS - CONVOY/RAIL

Unit Type	Rail Flatcar Type			Number of Vehicles Driven	Number of Vehicles Towed	Number of 20-ft Containers
	89-ft	60-ft	68-ft DODX			
Division:						
Air Assault	363	4	-	3,480	2,111	646
Airborne	402	4	-	2,651	1,607	841
Armored[1]	301	478	257	3,791	2,457	400
Infantry[2]	224	264	94	3,818	2,274	404
Light Infantry	159	6	-	1,906	1,283	411
Mechanized[1]	305	508	228	3,812	2,494	395
Regiment:						
Armored Cavalry[1]	87	138	88	906	535	96

[1]These three units contain LIN-Z10988 (Bridge Hvy Assault) in various quantities. This equipment is considered outsized for any of the transporters above.
[2]This unit contains LIN-C20414 (Bridge Arm Veh LCH), considered to be outsized for any of the transporters above.

Source:
MTMCTEA,s Transportability Analysis Reports Generator, using the October 1993 Table of Organization and Equipment and the October 1993 DA standard Equipment Configuration File.

Note:
Unit movement by rail/convoy requires the use of all assets shown for a particular unit.

VI. SEA TRANSPORT

A. GENERAL

This section provides transport planning data for the strategic sealift of unit equipment and other military cargo. Because of the unique nature of sea transport assets, this section is somewhat more extensive than the previous transport sections.

This section contains background information about strategic sealift, sealift sources, vessel types, current vessel inventories, vessel characteristics, unit movement data, special planning considerations, and ports.

B. BACKGROUND

1. Sealift Sources

The vessels referenced in this section comprise the dry cargo vessels of the Strategic Sealift Forces. Primary sources are: Government-owned/controlled vessels and commercial vessels.

a. Government-Controlled Vessels. Government-controlled vessels fall under the control of the Department of Transportation (DOT) or DOD. The DOT Maritime Administration (MARAD) is responsible for the Ready Reserve Force (RRF). USTRANSCOM, through its sealift command component, MSC, administers the Fast Sealift Ships and the Afloat Pre-positioning Force (APF) in their common-user role. The APF consists of 13 Maritime Pre-positioning Ships and the Afloat Pre-positioning Ships. These ships are available for common use after initial discharge and release by the theater commander.

b. Commercial Vessels. Commercial vessels make an important contribution to support a large-scale deployment, such as was conducted in Desert Storm. Sources of commercial charters for Government hire include US- and foreign-flag vessels. These vessels are usually hired under a time or voyage charter. Vessels under time charter are charters for a specific interval of time, such as for several years. Vessels under voyage charter are chartered for a specific number of voyages.

2. References

The ship data found in this section and corresponding tables were obtained from the following sources: Lloyd's Register of Ships, 1991-92; Jane's Containerization Directory, 1990-91; MARAD Report, Reserve Fleet Inventory Highlights, May 1992; MARAD Report, Characteristics and Index of Maritime Administration Ship Design, January 1991; MSC Report, Ship Register, March 1992; MSC Report 3110-4, Commander MSC Force Inventory, October 1993; MTMCTEA Pamphlet 700-4, Vessel Characteristics for Shiploading, September 1991; and MTMCTEA's dry cargo ship files.

C. TRANSPORT ASSETS

1. General Vessel Types

In planning a unit move by sea transport, a variety of ship types will most likely be encountered. The four conventional ship types are breakbulk, container, barge carriers, and roll on/roll off (RORO). In addition, various combinations of these four basic types may be encountered. Also, other vessels with unique characteristics or special support missions that are available are combined under the heading of Special. A brief description of each ship type follows:

a. Breakbulk. Breakbulk vessels fall under the category of general cargo ships. They are so designated because of their ability to carry a variety of cargoes in various forms. For example, these vessels can transport bagged, boxed, palletized, refrigerated, and limited containerized cargoes. The configuration of a conventional breakbulk vessel is a weather deck with a series of cargo holds beneath. The cargo holds are divided by 'tween decks and accessed by a series of hatches. Cargo operations on a breakbulk vessel are lift on/lift off (LOLO). Since each hold on a breakbulk vessel is serviced by ship's gear (booms, cranes, winches, and so forth), these vessels are considered to be self-sustaining. The breakbulk vessel is not the preferred vessel to transport tracked and wheeled military equipment. However, it does provide the valuable capability to carry such equipment and to offload itself (without the use of ashore cranes) in the wide variety of less modern, sophisticated ports in many countries throughout the world. The normal constraints encountered with breakbulk vessels are low overhead clearances, limited deck strengths, limited lifting capability of ship's gear, and slow speed.

b. Containerships. Containerships are designed to carry their entire cargo load in containers (usually 20 or 40 feet in length). The full cellular stowage within their holds allows containers to be secured without the use of dunnage. Containerships are configured for the stacked stowage of containers both in the space below the main deck (frequently referred to as the weather deck) and on the main deck. Since most containerships are non-self-sustaining (that is, lack an installed crane system) cargo operations require the use of shoreside cranes or auxiliary crane ships (T-ACS).

While containerships are designed to transport only standard containers, they do regularly use flatracks in commercial service without ship modification. The flatracks and seasheds fit in the containership's cell guides and create a false deck system. This system allows containerships to transport a limited number of oversized, wheeled, and heavy tracked equipment, which would normally be transported by RORO vessels. Flatracks and seasheds are also used onboard combination ships with container capability, such as the T-ACS and FSS.

As discussed here, oversized equipment is equipment that exceeds the dimensions of the 40-foot container. See table 38 for the various flatrack and seashed characteristics.

c. Barge Carriers. Barge carriers are designed to transport barges in which cargoes have been loaded. Such barges are loaded or discharged at berths by shore-based cranes. When cargo operations are complete, the barges are pushed or towed to the barge carrier, where the barges are brought aboard the vessel. The two types of barge carriers are the lighter aboard ship (LASH) and the sea barge (SEABEE). Both types are self-sustaining.

The basic differences between the two types are their methods of discharging, retrieving, and stowing barges. The LASH system employs its own gantry cranes for these tasks. When the barges have been loaded with cargo, they are towed or pushed by tug to the LASH vessel for loading. They are loaded aboard the vessel by gantry crane and stowed in a series of large holds and stacked one upon the other. LASH vessels have a carrying capacity of between 46 and 89 barges. The SEABEE system uses an elevator to accomplish the loading and discharging of barges aboard the vessel. In contrast to LASH barges, SEABEE barges are pulled from the elevator by a transporter and stowed in one of three decks upon barge pedestals. SEABEE vessels have a carrying capacity of 38 barges. However, currently only 24 barges are available per vessel. Typically, barges are loaded on the two lower 'tween decks, and heavy, oversized cargoes and watercraft are loaded on the weather deck.

d. RORO. RORO ships are designed as primary vehicle transports. Cargoes include helicopters, wheeled, tracked, self-propelled, and towed vehicles. RORO vessels are characterized by large cargo capacities and rapid cargo loading and discharge rates. The rapid movement of cargoes is accomplished by a series of external and internal ramps. The cargo holds are typically large, open bays, where equipment may be driven into, parked, and lashed down. Most RORO ships have external ramps that rest on the apron of the berth, allowing access to the cargo holds. For this reason, RORO ships are considered to be self-sustaining. Because of the versatility of these vessels, they are ideally suited for the movement of unit equipment.

e. Combination. A combination vessel employs the cargo operation features of the combined ship types making up its configuration. For example, a combination RORO and containership may have a stern ramp, RORO decks, and holds configured for the stowage of containers.

f. Special. The category of Special is comprised of special-mission and support vessels. Such vessels include semisubmersible, heavy-lift, integrated tug and barge (ITB) units, and T-ACS. These ships are referenced because most have a secondary mission of providing auxiliary sealift capability.

For example, the primary mission of the T-ACS is to offload non-self-sustaining cargo vessels (containerships) and barges moored alongside after the barges have been removed from the LASH/SEABEE ships. In addition to their capability to offload cargo from other vessels, the T-ACS would also carry cargo both on the weatherdeck and below deck. Of particular value is the weatherdeck capability of the T-ACS to carry and offload heavy watercraft and lighterage used in cargo discharge operations. A limited amount of unit equipment cargo can also be carried below deck in flatracks and seasheds. This cargo may also be offloaded using T-ACS cranes.

2. Current Vessel Inventory

A baseline inventory of available and militarily useful US-flag dry cargo vessels is shown in table 9. Table 9 lists vessels by type, component, and quantity. Appendix J contains the current listing of all US-flag militarily useful dry cargo ships, by ship type.

3. Planned Future Additions to Sealift Inventory

The DOD Mobility Requirements Study identified a shortfall of 2 million square feet in pre-positioned combat and combat support equipment. It identified a shortfall of 3 million square feet for surge sealift to carry combat and combat support equipment from the United States to meet selected conflict/contingency requirements, as set forth in the study. As a result of these findings, the DOD has established a program to procure 19 notional large, medium-speed RORO (LMSR) ships. Five of the 19 LMSRs will be civilian cargo vessels converted to LMSR configuration. The remaining 14 will be new construction LMSRs. The conversions are to be completed by the end of 1995. The remaining new construction LMSRs are scheduled to be completed between 1998 and 2001. Current plans are for 8 of the LMSRs to be pre-positioned overseas, with the remaining 11 LMSRs maintained in CONUS, to meet surge requirements. See table 11 for projected characteristics of these LMSRs.

D. TRANSIT DATA

1. Vessel Characteristics

Basic vessel characteristics necessary for planning vessel cargo operations are shown in tables 10 through 14. These tables list vessel characteristics by type and include the following data: MARAD/MSC classification (when applicable), or name, number of vessels in class, length, maximum draft, speed, cargo deadweight, available square feet, and single-lift capability, by type. For deck strengths of individual vessels, see MTMCTEA Pamphlet 700-4, Vessel Characteristics For Shiploading, September 1991.

TABLE 9
1994 INVENTORY OF US-FLAG DRY CARGO VESSELS

Ship Type	Component			Total by Ship Type
	MSC[1]	RRF	Militarily Useful US-Flag	
Breakbulk	9	48	19	76
Container			92	92
RORO	4	29[2]	15	48
Barge Carrier	5	7	6	18
Special:				
Auxiliary Crane		10[3]		10
FSS	8			8
FLOFLO	1			1
MPS	13	___	___	13
Total:	40	94	132	266

[1]These numbers include vessels that are prepositioned outside the CONUS (for example, PREPO fleet).
[2]The 12 ROROs of various sizes purchased by MARAD in Dec 92 will join the RRF in late 1993 and 1994.
[3]The tenth T-ACS (auxiliary crane) will join the RRF in 1994.

Legend:
MSC - Military Sealift Command
RRF - Ready Reserve Force
FSS - Fast Sealift Ship
FLOFLO - Float on/float off
MPS - Maritime Pre-position Ship

Source:
MARAD Report, Reserve Fleet Inventory Highlights, Jul 93;
MSC Report 3110-4, Commander MSC Force Inventory, Oct 93.

TABLE 10
VESSEL CHARACTERISTICS - BREAKBULK

Class	Length (ft-in.)	Maximum Draft (ft-in.)	Speed (knots)	Cargo Deadweight (LTON)	Available Square Feet	Maximum Boom Capacity (LTON)	TEU Capacity
Breakbulk							
C3-S-33a	483-3	31-5	17.75	9,880	54,898	75	-
C3-S-37c	494-8	29-6	17.75	9,030	52,539	60	-
C3-S-37d	494-8	30-1	17.75	8,264	54,907	60	-
C3-S-46a	493-0	30-6	18.50	10,450	73,833	60	-
C3-S-46b	493-0	30-6	18.50	10,700	73,833	60	-
C4-S-1u	565-0	31-7	19.80	9,875	73,597	60	206
C4-S-57a	560-6	31-6	20.75	11,880	65,182	70	128
C4-S-58a	572-0	30-7	20.00	8,800	57,052	60	-
C4-S-66a	540-0	31-7	20.00	9,160	72,044	88	-
Breakbulk/Container							
C3-S-38a	492-6	28-2	18.50	8,600	60,670	50	-
C3-S-76a	522-0	31-1	18.60	8,700	60,201	75	12
C4-S-64b	544-0	31-11	21.00	10,990	69,507	70	228
C5-S-37e	592-6	30-1	16.00	11,950	69,273	60	181
C5-S-37f	592-6	30-1	16.00	11,950	69,273	60	181
C5-S-75a	605-0	35-1	19.50	17,950	100,547	70	143
C6-S-60c	665-9	31-7	20.50	9,930	120,000	75	626
Green Ridge	507-2	26-8	17.00	9,388	51,006	21/41/78*	180
Green Wave	507-2	26-8	17.00	9,388	51,006	21/41/78*	180

* 21 singled, 41 doubled, and 78 quadded.

Legend:
TEU - 20-foot container equivalent unit.

TABLE 11
VESSEL CHARACTERISTICS - RORO

Class	Length (ft-in.)	Maximum Draft (ft-in.)	Speed (knots)	Cargo Deadweight (LTON)	Available Square Feet	Maximum Ramp Capacity (LTON)	TEU Capacity
C3-ST-14a	499- 0	27- 0	18.00	8,730	88,757	60.0	-
C4-S-67a	540- 0	29- 1	20.00	9,030	116,526	56.0	-
C5-S-78a	601- 6	34- 1	23.75	12,450	81,181	70.0	864
C7-S-95a	684- 9	32- 1	23.00	14,767	135,924	100.0	340
G0-Diesel (Cape E)	652-11	31- 5	17.00	17,902	150,400	220.0	309
G1-Diesel (Cape D)	681- 0	33- 0	18.00	21,650	187,249	65.0	554
G2-Diesel (Cape H)	749- 8	35- 5	17.00	26,742	178,948	63.9	676
Adm W. M. Callaghan	694- 3	29- 1	25.00	9,519	168,000	55.8	212
Ambassador/Senator	533-10	21- 2	17.00	7,030	79,558	59.1	-
American Eagle	635- 3	30- 3	19.50	18,219	183,178	91.6	252
Cape Lambert	682- 0	30- 6	19.00	10,065	184,000	30.0	-
FSS (NASSCO)	946- 1	36- 8	27.00	25,500	190,547	65.0	188
FSS (Avondale)	946- 1	36-10	27.00	25,500	208,685	65.0	188
FSS (PENNSHIP)	946- 1	36-10	27.00	25,506	200,241	65.0	188
Lyra	634- 3	28- 3	19.00	11,386	121,000	160.0	316
C-5-M-PVT11b[1]	598- 0	32- 0	18.50	17,369	84,599*	80.0	408
LMSR (Conversion)[2]	950- 0	35- 0	24.00	21,000	324,000	142.0	180
LMSR (New Construction)[2]	950- 0	35- 0	24.00	26,000	390,000	142.0	180

[1]Combination RORO/LOLO; maximum lift capacity 29.5 LTON singled, 59 LTON doubled, and 118 TON quadded; 35,553 available square feet RORO; balance LOLO.
[2]LMSR data shown are estimates provided for future planning considerations. The five conversion ships are scheduled for delivery in 1995, with delivery of newly constructed ships beginning in 1997.

Legend:
TEU - 20-foot container equivalent unit.

TABLE 12
VESSEL CHARACTERISTICS - BARGE CARRIER

Class	Length (ft-in.)	Maximum Draft (ft-in.)	Speed (knots)	Cargo Deadweight (LTON)	Available Square Feet	Maximum Lift Capacity (LTON)	Barge/TEU Capacity
SEABEE							
C8-S-82a	873-9	39-1	19.25	29,780	95,109	2,000 Elevator	38/ -
LASH							
C8-S-81b	820-0	35-1	20.00	30,020	127,256	446 Gantry Crane	49/164
C9-S-81d	893-4	38-1	19.10	36,650	203,324	455 Gantry Crane	74/276
C8-S-81h	820-0	40-9	19.75	33,000	127,256	446 Gantry Crane	87/ -

Legend:
TEU - 20-foot container equivalent unit
SEABEE - sea barge
LASH - lighter aboard ship

TABLE 13
VESSEL CHARACTERISTICS - CONTAINER

Class	Length (ft-in.)	Maximum Draft (ft-in.)	Speed (knots)	Cargo Deadweight (LTON)	Total TEU
C5-S-73b	610- 0	31- 7	20.00	10,960	928
C6-S-85a	669- 8	33- 0	22.50	14,400	1,186
C6-S-85b	669- 3	33- 0	21.00	14,050	1,186
C6-M-F146a	675-10	38- 2	19.00	28,260	2,411
C6-M-F147a	659- 7	25-11	17.00	10,060	1,104
C7-S-68c	700- 6	32- 0	22.25	12,800	1,178
C7-S-68d	700- 6	32- 0	22.25	12,080	1,210
C7-S-68e	704- 6	32- 9	22.25	11,380	1,434
C7-S-69c	663-11	30- 8	22.25	8,530	886
C7-S-88a	720- 6	34- 0	23.00	20,320	1,328
C7-M-F145a	643- 0	36- 0	18.00	26,000	1,928
C8-S-81e	820- 0	40- 9	21.00	24,500	1,902
C8-S-F81e	820- 0	40- 9	21.50	24,600	1,920
C8-S-85c	813- 3	33- 0	21.00	22,340	1,708
C8-S-85d	813- 3	33- 0	21.00	21,880	1,708
C9-M-132b	863- 2	35- 0	23.75	18,360	2,492
C9-M-F141a	950- 0	38- 3	19.00	32,140	4,238
C9-M-F148a	853-10	41- 0	22.00	34,850	2,284
C9-M-F151a	849- 9	39- 0	21.00	29,500	3,006
C10-M-F150a	903- 0	41- 0	24.00	45,000	4,300

Legend:
TEU - twenty-foot equivalent unit

TABLE 14
VESSEL CHARACTERISTICS - SPECIAL

Class	Length (ft-in.)	Maximum Draft (ft-in.)	Speed (knots)	Cargo Deadweight (LTON)	Available Square Feet	Maximum Lift Capacity (LTON)	TEU Capacity
Auxiliary Crane							
C6-S-1qd (T-ACS 1-3)	668- 8	33- 3	19.50	10,370	42,560	105.0	264
C5-S-MA73c (T-ACS 4-6)	610- 0	31- 6	20.00	9,090	52,000	120.0	711
C6-S-MA1xb (T-ACS 7-8)	668- 0	33- 4	20.00	9,400	38,000	120.0	670
C6-S-MA60d (T-ACS 9)	665- 9	31- 7	20.00	6,564	*	120.0	380
Heavy-lift							
C1-MT-123a	300- 2	16-10	12.80	2,730	14,615	425.2	-
FLOFLO							
American Cormorant	738- 4	44- 5	13.00	47,230	52,401	47,230.0	-
MPS							
C7-S-133a (Squadron 1)	821- 0	33- 6	18.00	25,000	152,200	100.0	536
Maersk (Squadron 2)	755- 5	32-10	17.20	23,000	121,600	132.0	335
AmSea (Squadron 3)	673- 2	32- 1	18.00	25,384	152,200	39.0	523
ITB							
Hawk	417- 2	13- 2	8.00	8,486	78,000	65.0	-
Falcon	417- 2	13- 2	8.00	8,486	78,000	65.0	-
Strong American	568- 0	24- 0	16.00	6,450	88,260	68.0	-
Strong Texan	268- 0	18- 0	12.00	6,450	21,000	315.0	-

*Information not available at time of publication.

Legend:
TEU - 20-foot container equivalent unit
FLOFLO - Float on/float off
MPS - Maritime Pre-positioned Ship
ITB - Integrated tug and barge

One of the most important planning elements found in these tables is the available square feet for loading cargo. The listed stowage areas represent the maximum available area. This figure cannot be used as is, but must be reduced. This reduction takes into account obstructions found in the cargo hold, dead space around the cargo, the area required for lashing gear or blocking and bracing, fire lanes, and so forth. The ratio between a ship's capacity and the actual amount of cargo that can be loaded is the stow factor. Stow factors are expressed in the form of percentages. For planning purposes, the available square feet must be multiplied by a stow factor, to arrive at a proper planning cargo capacity of a vessel. Stow factors vary according to the type of cargo and vessel. In the absence of pertinent cargo and vessel information, a stow factor of 75 percent can be used for general planning purposes. Tables 15 through 18 list average stow factors that can be applied to individual ship types.

2. Vessel Loading and Discharge Times

Table 15 lists average cargo loading and discharge times by ship type. These are general shiploading planning factors. Tables 16 through 18 list average Desert Storm cargo loading and discharge times. These tables are the result of an extensive analysis of actual Desert Storm vessel cargo operations.

3. Port Time

Tables 15 through 18 do not reflect the total time a ship is in port. Other factors besides loading and discharge operations affect the total port time of a vessel. Examples of such factors are piloting and docking procedures, tides and weather, bunkering operations, receiving ship's stores, and casting off procedures. For planning the port time of a vessel, we suggest adding 1 day to the vessel loading or discharge time.

E. UNIT MOVEMENT REQUIREMENTS

The sea transport assets necessary to deploy or redeploy six Army-type divisions and an armored cavalry regiment are shown in tables 19 and 20. These tables list sample ship mixes and quantities and types of vessels required to move each unit. Table 19 lists ship requirements when minimum containerization is utilized, and table 20 lists ship requirements when maximum containerization is utilized.

The Amphibious Marine Expeditionary Brigade (MEB), Assault Follow-on Echelon (AFOE) sealift support requirements are listed in tables 21 and 22. Table 23 shows notional ship mixes to support the deployment of an amphibious task force (MEB) as an enabling force that includes an assault echelon and an assault follow-on force (AFOE). Table 24 shows a notional volume of equipment and supplies to sustain an MEB for 30 days, and table 25 shows notional sea-based daily resupply requirements for the MEB. Marine Corps data was provided by Headquarters, Marine Corps.

TABLE 15
AVERAGE SHIPLOADING AND UNLOADING TIMES

Ship Type	Percent Stow	Load Time (days)	Unload Times (days)
Breakbulk	75	3	3
Breakbulk/Container	75	3	3
Barge Carrier (LASH)[1]	75	12	12
Barge Carrier (SEABEE)[1]	75	7	7
RORO	75	2	2
FSS	75	2	2
MPS	80	3	3/5[2]

[1]Includes barge cargo operation times (4 hrs per LASH barge and 6 hrs per SEABEE).
[2]Pierside/instream

Legend:
LASH - Lighter aboard ship
SEABEE - Sea barge
RORO - Roll on/roll off
FSS - Fast sealift ship
MPS - Maritime Pre-positioned Ship

TABLE 16
DESERT STORM AVERAGE SHIPLOADING AND UNLOADING TIMES,
DEPLOYMENT (UNIT EQUIPMENT)

Ship Type	Available Square Feet	Percent Stow	Usable Square Feet[2]	Load Time[1] (days)	Square Feet per Hour	Number of Pieces	Pieces per Hour	Unload Time (days)
Breakbulk	52,081	84	43,748	3	583	366	5	3
Breakbulk/Container	71,676	71	50,890	3	719	435	6	3
FSS	200,906	73	146,661	2	2,834	850	16	3
Barge Carrier-LASH	127,256	56	71,263	10	309	757	3	11
Barge Carrier-SEABEE*	95,109	68	64,674	3	812	400	5	6
RORO (small)	37,265	90	33,538	1	1,761	227	12	1
RORO (medium)	75,650	83	62,789	2	1,569	392	9	2
RORO (medium/large)	124,282	73	90,726	2	2,244	539	13	2
RORO (large)	183,788	70	128,652	2	2,701	709	15	2
MPS	152,200	71	108,062	3	1,659	692	10	5
Auxiliary Crane (T-ACS)	45,500	89	40,495	13	134	270	1	3

[1]Loading times reflect lift on/lift off cargo operations of vehicles and combination cargoes, and not barge operations.
[2]Usable square feet is the actual space that can be used after taking the stow factor into consideration.

Legend:
FSS - Fast sealift ship
LASH - Lighter aboard ship
SEABEE - Sea barge
RORO - Roll on/roll off
MPS - Maritime Pre-positioned Ship

TABLE 17
DESERT STORM AVERAGE SHIPLOADING AND UNLOADING TIMES,
REDEPLOYMENT (UNIT EQUIPMENT)

Ship Type	Available Square Feet	Percent Stow	Usable Square Feet[2]	Load Time[1] (days)	Square Feet per Hour	Number of Pieces	Pieces per Hour	Unload Time (days)
Breakbulk	59,769	64	38,252	4	404	254	3	1
Breakbulk/Container	76,095	61	46,418	4	478	293	3	2
FSS	200,090	73	146,066	4	1,642	788	8	2
Barge Carrier-LASH	177,670	30	53,301	11	200	344	1	4
Barge Carrier-SEABEE	95,109	76	72,283	4	865	478	6	10
RORO (small)	37,821	88	33,282	1	1,142	190	6	1
RORO (medium)	74,274	87	64,618	2	1,162	324	6	1
RORO (medium/large)	127,258	73	92,898	3	1,368	484	7	1
RORO (large)	187,408	64	119,941	3	1,720	590	9	2
MPS	152,200	82	124,804	5	1,407	1,153[3]	9	3
Auxiliary Crane (T-ACS)	45,500	95	43,225	4	456	305	3	3

[1]Loading times reflect LOLO cargo operations of vehicles and combination cargoes, and not barge operations.
[2]Usable square feet is the actual space that can be used after taking the stow factor into consideration.
[3]Marine Corps equipment only.

Legend:
FSS - Fast sealift ship
LASH - Lighter aboard ship
SEABEE - Sea barge
RORO - Roll on/roll off
MPS - Maritime Pre-positioned Ship
LOLO - Lift on/lift off

TABLE 18
DESERT STORM AVERAGE SHIPLOADING AND UNLOADING TIMES,
DEPLOYMENT/REDEPLOYMENT (AMMUNITION)

Ship Type	Available MTON	Percent Stow	Load Time (days)	MTON per Hour	Unload Time (days)
Deployment:					
Breakbulk	9,349	70	9	30	8
Breakbulk/Container	8,800	64	9	27	8
Barge Carrier-LASH	23,500	66	13	49	9
Redeployment:					
Breakbulk	9,750	83	16	38	12
Breakbulk/Container	9,000	80	21	14	9

TABLE 19
STRATEGIC SEA TRANSPORT REQUIREMENTS
MINIMUM CONTAINERIZATION

Unit/ Sample Ship Mix	VESSEL TYPE FSS (RORO/COMB)	LMSR[2] (RORO/COMB)	Notional RORO[3] (RORO/COMB)	C3/C4 (Breakbulk)
Air Assault Div:				
All FSS	6.5			
LMSR and FSS	-	4.0		
Notional RORO			8.0	
All Breakbulk				21.5
Airborne Div:				
All FSS	4.1			
LMSR and FSS	-	2.6		
Notional RORO			5.1	
All Breakbulk				15.3
Armored Div:				
All FSS[1]	8.0	1.2		
LMSR and FSS	1.9	5.0		
Notional RORO			12.3	
All Breakbulk				32.0
Infantry Div:				
All FSS	7.7			
LMSR and FSS	-	4.7		
Notional RORO			9.4	
All Breakbulk				24.7
Light Infantry Div:				
All FSS	2.8			
LMSR and FSS	-	1.8		
Notional RORO			3.5	
All Breakbulk				9.6
Mechanized Div:				
All FSS[1]	8.0	1.3		
LMSR and FSS	1.9	5.0		
Notional RORO			12.3	
All Breakbulk				32.1
Armored Cavalry Regt:				
All FSS	2.9			
LMSR and FSS	-	1.8		
Notional RORO			3.5	
All Breakbulk				9.1

[1]Only eight FSS are available. LMSR vessels are shown picking up the residual FSS shortfall to meet unit shipping requirements.
[2]Five conversion LMSRs are scheduled for delivery in late 1995.
[3]Notional cargo capacity (usable sq ft after stow factor) and TEU container capacity used above for the various vessel types are:

FSS - 149,868 sq ft, 188 TEU; RORO - 122,000 sq ft, 367 TEU;
LMSR - 243,000 sq ft (269,000 in 2001), 180 TEU; C3/C4 - 48,100 sq ft.

Legend:
TEU - 20-foot container equivalent units.

Source:
MTMCTEA's Transportation Analysis Reports Generator,using the October 1993 Table of Organization and Equipment and the October 1993 DA standard Equipment Configuration File.

TABLE 20
STRATEGIC SEA TRANSPORT REQUIREMENTS
MAXIMUM CONTAINERIZATION

Unit/ Sample Ship Mix	VESSEL TYPE FSS (RORO/COMB)	LMSR[1] (RORO/COMB)	Notional RORO[2] (RORO/COMB)	C3/C4 (Breakbulk)	C6/C7/C8 (Container)
Air Assault Div:					
FSS/Container	1.41				4.3
LMSR/Container		.87			4.3
RORO/Container			1.73		4.3
Breakbulk/Container				4.38	4.3
Airborne Div:					
FSS/Container	0.50				3.3
LMSR/Container		0.31			3.3
RORO/Container			0.61		3.3
Breakbulk/Container				1.56	3.3
Armored Div:					
FSS/Container	4.07				4.7
LMSR/Container		2.51			4.7
RORO/Container			5.00		4.7
Breakbulk/Container				12.69	4.7
Infantry Div:					
FSS/Container	2.25				4.3
LMSR/Container		1.39			4.3
RORO/Container			2.76		4.3
Breakbulk/Container				7.0	4.3
Light Infantry Div:					
FSS/Container	0.46				2.2
LMSR/Container		0.28			2.2
RORO/Container			0.56		2.2
Breakbulk/Container				1.42	2.2
Mechanized Div:					
FSS/Container	4.04				4.7
LMSR/Container		2.49			4.7
RORO/Container			5.97		4.7
Breakbulk/Container				12.59	4.7
Armored Cavalry Regt:					
FSS/Container	1.23				1.2
LMSR/Container		0.79			1.2
RORO/Container			1.58		1.2
Breakbulk/Container				4.02	1.2

[1]Five conversion LMSRs are scheduled for delivery in late 1995.

[2]Notional cargo capacity (usable sq ft after stow factor) and TEU container capacity used above for the various vessel types are:

FSS - 149,868 sq ft, 188 TEU; RORO - 122,000 sq ft, 367 TEU; C6/C7/C8 - 1,534 TEU; LMSR - 243,000 sq ft (269,000 in 2001), 180 TEU; C3/C4 - 48,100 sq ft.

Legend:
TEU - 20-foot container equivalent units.

Source:
MTMCTEA's Transportation Analysis Reports Generator,using the October 1993 Table of Organization and Equipment and the October 1993 DA standard Equipment Configuration File.

TABLE 21
NOTIONAL ASSAULT FOLLOW-ON ECHELON MOVEMENT REQUIREMENTS
MARINE EXPEDITIONARY BRIGADE - EAST COAST

Vessel Type	Vessel Class	Number of Vessels	Anticipated Seaport of Embarkation
Breakbulk	C5-S-75a	1	Wilmington, NC
Breakbulk	C4-S-1u	1	Wilmington, NC
Breakbulk	C4-S-66a	1	Norfolk, VA
BB/Cont	C6-S-60c	1	Norfolk, VA
RORO	Cape H	1	Wilmington, NC
RORO	C3/C4	1	Wilmington, NC
RORO	Cape I	1	Gulfport, MS
SEABEE	C8-S-82A	1	Jacksonville, FL
T-ACS	C6-S-MA1Q	1	Wilmington, NC
T-ACS	C5-S-MA73	1	Norfolk, VA
RRF Tanker	Tanker	1	Wilmington, NC
Tanker	OPDS	1	Norfolk, VA

Legend:
- BB/Cont - Breakbulk/container combination
- RORO - Roll on/roll off
- SEEBEE - Sea barge
- T-ACS - Auxiliary crane
- RRF - Ready Reserve Force

Note:
This ship mix is notional in concept; it most closely represents a probable method of deployment, but is not intended to imply strict doctrine.

TABLE 22
NOTIONAL ASSAULT FOLLOW-ON ECHELON MOVEMENT REQUIREMENTS
MARINE EXPEDITIONARY BRIGADE - WEST COAST

Vessel Type	Vessel Class	Number of Vessels	Anticipated Seaport of Embarkation
Breakbulk	C5-S-75A	1	San Diego, CA
Breakbulk	C4-S-1U	1	Long Beach, CA
Breakbulk	C4-S-66A	1	San Francisco, CA
BB/Cont	C6-S-60C	1	San Francisco, CA
RORO	Cape H	1	San Diego, CA
RORO	C3/C4	1	Long Beach, CA
RORO	Cape I	1	Port Hueneme, CA
SEABEE	C8-S-82A	1	Port Hueneme, CA
T-ACS	C6-S-MA1Q	1	San Diego, CA
T-ACS	C5-S-MA73	1	Port Hueneme, CA
RRF Tasnker	Tanker	1	San Francisco, CA
Tanker	OPDS	1	San Francisco, CA

Legend:
BB/Cont - Breakbulk/container combination
RORO - Roll on/roll off
SEEBEE - Sea barge
T-ACS - Auxiliary crane
RRF - Ready Reserve Force

Note:
This ship mix is notional in concept; it most closely represents a probable method of deployment, but is not intended to imply strict doctrine.

TABLE 23
NOTIONAL AMPHIBIOUS AND STRATEGIC SEALIFT SHIP MIX
AMPHIBIOUS MARINE EXPEDITIONARY BRIGADE

Assault Echelon Shipping		Assault Follow-on Echelon Shipping	
1	LHD	3	Breakbulk
2	LHA	3	RORO
2	LPH	1	BB/Cont
4	LPD	2	T-ACS
4	LSD	1	SEABEE
5	LST	2	Tanker
+ 1	LKA	+ 1	TAVB
19	Amphibious Ships	13	Black Bottom Ships

Note:
These ship mixes are notional in concept; they closely represent a probable method of deployment, but are not intended to imply strict doctrine. Vessel availability, retirements, and changes to unit organization based upon operational and support considerations, will cause adjustment to these ship mixes.

TABLE 24
NOTIONAL VOLUME OF EQUIPMENT AND SUPPLIES
AMPHIBIOUS MARINE EXPEDITIONARY BRIGADE

Classification of Supply	Short Tons	Gallons of Fuel
Class I: Subsistance	1,150	
Class II: Organizational equipment	1,836	
Class III: Packaged POL	2,100	2.7 Mil ground 14.1 Mil aviation
Class IV: Construction materials	840	
Class V Ammunition	25,936	
Class VIII Medical	314	
Class IX Repair parts	2,319	

A total of 800,000 sq ft of vehicles, split between 300,000 sq ft to the Assault Echelon and 500,000 sq ft to the Assault Follow-on Echelon. The following is a sampling of those square-loaded items:

QTY	VEHICLE TYPE	QTY	VEHICLE TYPE
365	5-Ton Trucks	372	HMMWV Trucks
96	LVS Dragon Wagons	19	5,000-Gal Refuelers
24	M-198 Howitzers		

Note:
These figures are notional; they closely represent a probable deployment structure, but are not intended to imply strict doctrine.

TABLE 25
NOTIONAL SEA-BASED DAILY RESUPPLY REQUIREMENT
FOR AN AMPHIBIOUS MARINE EXPEDITIONARY BRIGADE

Classification of Supply	Short Tons	Gallons of Fuel
Class I: Subsistance	38	
Class II: Organizational equipment	61	
Class III: Packaged POL	70	62,000 ground 450,000 aviation
Class IV: Construction materials	28	
Class V: Ammunition	865	
Class VIII: Medical	10	
Class IX:	77	

Note:
These figures are notional; they closely represent a probable usage rate, but are not intended to imply strict doctrine. These numbers represent an average DOS/DOA, based upon an amphibious MEB's total fingerprint of accompanying supplies. Actual consumption per day may vary given scenario-driven factors.

Legend:
DOS - Day of Supply
DOA - Day of Ammunition
MEB - Marine Expeditionary Brigade

This Marine Air Ground Task Force is listed because it requires the use of RRF assets. The deployment of an AFOE in support of a Marine Expeditionary Force requires an increased use of RRF assets.

F. SPECIAL PLANNING CONSIDERATIONS

The sea transport arena is not a static environment. Planning personnel must be able to react and adjust to sudden asset and schedule changes. Special planning considerations that could have a drastic impact upon the planning and execution of a sea transport cargo operation are listed below:

1. Availability of Preferred Sea Transport Assets

It cannot be assumed that preferred vessel types and quantities of vessels will be readily available. Close coordination with MSC is required.

2. Availability of Port Assets

It cannot be assumed that all assets at a particular port are at the disposal of operations personnel. For this reason, it is very important that available port assets (such as staging areas, berths, cranes, and materials handling equipment) necessary to support a sealift operation be identified.

A more detailed discussion of these and related issues can be found in FM 55-65; MTMCTEA Pamphlet, Marine Terminal Lifting Guidance, 1989; and MTMC Regulation 56-69, Surface Transportation Terminal Operations, August 1989.

G. PORT CHARACTERISTICS

Compatibility between vessels chosen for a sealift operation and the SPOE is essential. Berthing capability and other such specific characteristics about individual CONUS ports and specific marine terminals are in MTMC Report SE 89-3d-31, Ports for National Defense (PND), October 1990.

VII. AIR TRANSPORT

A. GENERAL

This section provides data useful for notional planning for air transport by fixed-wing aircraft. Air Force Pamphlet (AFP) 76-2 should be consulted for specific details for planning actual movement of unit equipment (including vehicles) and supplies.

B. BACKGROUND

Air transport assets are derived from two sources: military air assets and civil aircraft.

Certification/qualification procedures for air movement of equipment transportable on the different US Air Force (USAF) and Civil Reserve Air Fleet (CRAF) aircraft are in TB 55-45, AFP 76-19, and TB 55-46-1. MIL-STD-1791 contains specific criteria for the design of air-transportable unit equipment.

C. TRANSPORT ASSETS

1. USAF Assets

The fixed-wing aircraft available for strategic airlift are the USAF C-130, C-141, C-5, C-17, and KC-10. The maximum allowable cabin load for each aircraft depends upon a number of variables, such as weather, runway length, altitude, and mission range. The C-27A is the USAF's newest tactical airlift asset. AFP 76-2 provides broad planning factors that are useful for mission planning.

a. C-130 Hercules. The C-130 is chiefly a tactical, intratheater aircraft. It is not intended to be used for long-haul strategic deployment. However, it is capable of long-range, over-ocean flight, and for some missions, it may be the most desirable lift asset.

b. C-141 Starlifter. The C-141 is the workhorse of the strategic airlift fleet. It is used mainly for worldwide strategic deployment sustainment and for redeployment. It can be configured for aeromedical evacuation and airdrop delivery of heavy equipment loads, container delivery system, and personnel.

c. C-5 Galaxy. The C-5 is used for worldwide strategic deployment, sustainment, and redeployment, with a special capability of airlifting outsize equipment. It can be configured for strategic airdrop of heavy equipment loads and personnel.

d. KC-10 Extender. The KC-10 is mainly a mobility enhancement air-to-air refueling aircraft. It can also carry 25 or 27 463L pallets or 14 to 70 passengers.

e. C-17 (Globemaster III). The C-17 will be a complement to the airlift fleet and capable of both high capacity strategic deployment and tactical forward airfield delivery. It will occupy about the same ramp space as the C-141, be able to generate the same unconstrained cargo throughput capacity as the C-5, and be able to land at numerous austere airfields, accessible to the C-130, but unavailable to either the C-141 or C-5. Also, the cargo compartment is designed for side-by-side loading of two 99-inch-wide vehicles or ISO containers in a single row. The C-17 data shown in the following tables is the most current data available, as reflected in the 15 September 1993 Operational Requirements Document (ORD), and is still subject to change. The C-17 is still in test, and these figures reflect desired values (objectives) or minimum values (thresholds). While "thresholds" must be met, "objectives" are goals and may not be achieved in the final production configuration.

f. C-27A (Spartan). With its short takeoff and landing capability, heavy lifting capacity, and mission versatility, the C-27A fills the long-vacant niche between vulnerable, shorter-ranged helicopters and the more logistics-intensive C-130. It will be used almost exclusively in a tactical role and will be capable of operating in and out of remote, austere locations, using a 1,800-foot semiprepared runway. It will be capable of transporting 14,859 pounds of cargo on three HCU-6E pallets or various wheeled vehicles (HMMWV, M102/M119). Cargo may also include 34 ground combat troops or 24 combat paratroops.

2. CRAF

The CRAF program is a voluntary civil and military partnership that uses commercial aircraft to support DOD airlift requirements during airlift emergencies. For the DOD to efficiently use this resource with minimum disruption to civil commercial services, the CRAF is activated in three stages, as shown below:

a. Stage I - Committed Expansion.

b. Stage II - Airlift Emergency.

c. Stage III - National Emergency CRAF Activation.

Activation procedures for CRAF Stages I, II, and III: Commander in Chief, US Transportation Command, with the approval of the Secretary of Defense or the Secretary's designee, may activate any stage of CRAF during national emergencies and defense-oriented situations when expanded civil augmentation of military airlift is required.

Once activated, response time for carriers, after mission is assigned, is 24 hours for aircraft called up for Stages I and II, and 48 hours for aircraft called up for Stage III. The exact number and type of aircraft in each stage varies during each CRAF contract cycle, based on airline inventory and policies. AMC publishes a quarterly CRAF Capability Summary.

D. TRANSIT DATA

1. Terminology

The following is a list of general air loading terms and definitions:

a. 463L Pallet. A 463L pallet is an aluminum surfaced, balsa wood core pallet designed for rollerized handling in and around cargo aircraft. With cargo restraining nets and straps, each pallet weighs 354 pounds and takes up 2.25 inches of the aircraft headroom. The usable space on a pallet is 104 inches wide by 84 inches long. Each pallet can carry 10,000 pounds of cargo. Height restrictions vary by the aircraft and the cargo weight of the pallet. The design height limit is 96 inches. For the C-130 and C-141, if the pallet load does not exceed 8,000 pounds, the height limit is 100 inches. Pallets can be trained (linked) to carry items that exceed the length limit of a single pallet.

b. Passenger Planning Weights:

(1) With web gear and weapon or carryon baggage - 210 pounds.

(2) With web gear, weapon, and rucksack or combat equipment/tools - 350 pounds.

(3) With web gear, weapon, rucksack or equipment/ tools, and duffle bag - 400 pounds.

c. Non-Air Transportable Cargo. Any single piece of cargo that exceeds the capabilities of the C-5 aircraft.

d. Outsize Cargo. Any single piece of cargo that is more than 1,090 inches long, 111 inches wide, or 103 inches high in any one dimension and requires the use of C-5 aircraft. In essence, outsize cargo is any piece of cargo exceeding the capabilities of the C-141.

e. Oversize Cargo. Cargo that exceeds any of the following dimensions: 104 inches long, 84 inches wide, or 96 inches high, but is equal to or less than 1,090 inches long, 111 inches wide, and 103 inches high.

f. Bulk Cargo. General cargo (including the 463L pallet) that is within the usable dimensions of a 463L pallet and within the height and width requirements established by the cargo envelope of the particular aircraft.

2. USAF Planning Factors

Tables 26 through 30 provide characteristics, capabilities, and restrictions for the aircraft of the military airlift fleet.

3. CRAF Planning Factors

AMC Regulation 55-8 establishes procedures for the CRAF program. AMC Pamphlet 55-41 gives detailed information and guidance on use of CRAF cargo aircraft. This pamphlet should be used during the initial stage of establishing CRAF cargo loads. Narrow-body aircraft, like the B-707 and DC-8, are limited mainly to bulk cargo, while wide-body aircraft, like the B-747 and DC-10, carry bulk and oversize cargo. Tables 31 and 32 provide basic planning factors for the use of CRAF resources. Table 33 provides CRAF cargo and passenger capabilities for the three CRAF stages, and table 34 provides the number of aircraft available, by stage, for each flight segment.

E. UNIT MOVEMENT REQUIREMENTS

Tables 35 and 36 list the aircraft required for strategic deployment of the unit equipment for six Army-type divisions and an armored cavalry regiment. Also shown are the numbers of passengers not accompanying the unit equipment. Table 37 details the different movement echelons for both Army and Marine Corps forcible entry assault forces.

TABLE 26
USAF AIRCRAFT PERFORMANCE DATA

Aircraft Type	Cruise Speed (knots)	Block Speed (knots)[1]	Ferry Range (mi)[2]	Inventory	
				Active	R/NG[3]
C-5	450	428	6,238	70	39
C-17	425	400[4]	4,600	102[5]	0
C-141	425	415	4,531	210	24
C-130	300	288	3,962	160	281
KC-10	480	462	8,190	38	0
C-27A	250	NA	1,500	0	0

[1]Average speed, including takeoff, climb to cruise, cruise, descent, and taxi, based on 3,000-nautical mile leg.
[2]Maximum range (nautical miles) for pre-positioning the aircraft with no payload, without refueling.
[3]Reserve/National Guard.
[4]No official figure exists for C-17 Block Speed. AMC estimates 400 nautical miles per hour, based on experience with the C-141, which has the same cruise speed.
[5]The C-17 fleet will not reach full operational capability (102 aircraft) until after FY 2001. Initial operational capability of the squadron of 12 aircraft is anticipated in the fall of 1994.

Legend:
NA - Not applicable
AMC- Air Mobility Command

Source:
AF Pamphlet 76-2

TABLE 27
USAF MAXIMUM PAYLOAD
(POUNDS)

Aircraft Type	Condition	Leg Length (nautical mi) 2,000	2,500	3,000[1]	Maximum 463L Pallets	Maximum Troops
C-5	Peacetime	225,400	199,800	150,000	36	73
	Wartime					340
C-17	Peacetime	169,000	153,000	130,000	18/11[2]	102
	Wartime					
C-141	Peacetime	68,600	59,800	50,000	13	143
	Wartime	88,520	72,500	66,600		153
C-130H	Peacetime	32,400	25,000	25,000	6	74
	Wartime	41,600	NA	NA		91
KC-10	Peacetime	166,000	166,000	166,000	27	75
	Wartime					

[1]3,000-mile-leg data is taken from FM 55-9.
[2]Double row with 88-inch width allows 18, while a single row with 108-inch width allows 11 pallets.

Legend:
NA - Not applicable

Source:
AF Pamphlet 76-2

TABLE 28
USAF AVERAGE PAYLOAD
(POUNDS)

Aircraft Type	Condition	Leg Length (nautical mi) 2,000	3,000
C-5	Peacetime	149,000	138,200
	Wartime	149,000	138,200
C-17	Peacetime	132,000	94,000
	Wartime	132,000	94,000
C-141	Peacetime	52,000	47,800
	Wartime	53,000	52,800
C-130H	Peacetime	22,800	17,400
	Wartime	25,000	NA
KC-10	Peacetime	118,000	118,000
	Wartime	118,000	118,000

Note:
Calculated for oversize cargo, except for the KC-10 KC-10, which is for bulk cargo. Includes weight of the 463L pallets, except on C-130's and KC-10's. Based on worldwide fleet usage.

Legend:
NA - Not applicable

Source:
AF Pamphlet 76-2

TABLE 29
USAF AIRCRAFT EQUIPMENT DIMENSIONAL LIMITS

Aircraft Type	Equipment Limits		
	Height (in.)	Width (in.)	Length (in.)
C-5	156[1]	216[2]	1,454
C-17[3]	142[4]	204	784
C-141	103	111	1,090
C-130	102	107[5]	480

[1]For item widths up to 144 inches.
[2]For item heights up to 108 inches.
[3]The C-17 cargo ramp is 238 inches long with a 40,000-pound cargo capacity.
[4]Aft of wing box, height is 156 inches.
[5]Maximum pratical width at floor for roll on/roll off of tracked vehicles is 100 inches.

Source:
AF Pamphlet 76-2

TABLE 30
USAF AIR TRANSPORT (C-130/C-141) RESTRICTIONS - TRACKED VEHICLES

Vehicle Design Characteristics					
Maximum Height (in.)	Maximum Width (in.)	Single Axle Load (lb)	Maximum Concentrated Load (lb per sq in)	Maximum Linear Load (lb per lin ft)	Gross Weight (lb)
102	105[1]	10,000[2]	50[3]	3,000	44,000

[1]Practical maximum width at the floor is 100 inches for the C-130. Limitation is to a height of 5.5 inches.
[2]Three inches of parking shoring is required on the C-141.
[3]For the C-141, loads between the treadways are limited to 25 lb per sq in.

Source:
AF Pamphlet 76-2

TABLE 31
CRAF LONG-RANGE INTERNATIONAL CARGO PLANNING FACTORS

Aircraft Type	Maximum ACL (STON)	Pallets	Range with Maximum ACL (nautical mi)	Maximum ACL (STON) per Leg Length (nautical mi)				Ferry Range No Cargo (nautical mi)
				2,000	2,500	3,000	3,500	
B707-300C	43.0	13	3,600	43.0	43.0	43.0	43.0	6,700
DC-8-51F/52F	30.0	13	2,500	30.0	30.0	25.5	21.0	4,000
DC-8-54F/55	48.5	13	2,200	48.5	46.5	40.0	32.2	5,100
DC-8-61F	41.0	18	3,000	41.0	41.0	41.0	30.5	4,820
DC-8-62F/CF	45.0	14	2,800	45.0	45.0	44.0	40.9	5,600
DC-8-63F/CF	51.0	18	2,300	51.0	44.5	42.8	32.8	5,800
DC-8-71F	48.0	18	1,700	47.2	46.0	45.0	39.7	6,400
DC-8-73F/CF	53.1	18	2,800	53.1	53.1	51.8	47.0	6,800
DC-10-10CF	41.5	30	2,250	41.5	38.0	31.0	24.0	3,800
DC-10-30CF	74.3	30	3,300	74.3	74.3	74.3	71.0	6,000
DC-10-30F	90.0	30	1,530	88.5	88.0	86.5	82.0	7,000
B747-100F	108.5	36	1,700	107.5	106.5	100.0	89.5	5,700
B747-100C	105.5	30	2,600	105.5	105.5	97.0	86.0	6,000
B747-200F	128.6	36	2,425	128.6	126.7	121.6	111.6	6,475
B747-200C	107.6	30	2,150	107.6	106.0	101.8	91.8	6,100
MDII-F	94.0	35	3,500	94.0	94.0	94.0	94.0	7,500

Legend:
ACL - Allowable cabin load

TABLE 32
CRAF LONG-RANGE INTERNATIONAL PASSENGER PLANNING FACTORS

Aircraft Type	Maximum Seats	Range with Maximum Troops (nautical mi)	Maximum Troops per Leg Length (nautical mi) 2,000	2,500	3,000	3,500	Ferry Range No Troops (nautical mi)
B707-300	126	3,950	126	126	126	126	6,000
DC-8-62	115	4,700	115	115	115	115	5,400
DC-8-63	170	3,500	170	170	170	170	5,400
DC-8-71	141	3,250	141	141	141	125	4,850
DC-10-10	221	2,000	221	180	143	103	3,900
DC-10-30	260	3,800	260	260	260	260	5,700
DC-10-40	208	3,200	208	208	208	183	5,500
B747-SP	202	5,100	202	202	202	202	6,400
B747-100	404	2,950	404	404	395	346	5,900
B747-200	365	3,680	365	365	365	365	6,200
B747-400	315	5,950	315	315	315	315	8,000
B767-200ER	173	3,700	173	173	173	173	6,000
B767-300ER	207	4,000	207	207	207	207	6,500
L1011-50	194	2,560	194	194	159	126	3,950
L-1011-100/200	203	3,400	203	203	203	178	4,000
L-1011-500	205	4,300	205	205	205	205	6,400

Note:
Troop weights are compared at 400 pounds each, which includes personal equipment and field gear for combat operations.

TABLE 33
CRAF TOTAL LONG-RANGE CARGO/PASSENGER CAPABILITY

Long-Range Capability	Stages I	Stages II	Stages III
Total Passenger Capability (MPM)	19.19	50.09	142.66
Narrow-Body Capability (MTM)	.99	2.36	4.85
Wide-Body Cargo Capability (MTM)			
-Oversize	1.85	3.48	7.00
-Combination	3.20	7.52	12.73
Total Cargo Capability (MTM)	4.19	9.88	17.58

Note:
Capability reflected in millions of ton miles or passenger miles (MTM or MPM) per day.

Source:
AMC HQ Form 312, Civil Reserve Air Fleet (CRAF) Capability Summary, 1 Jul 93.

TABLE 34
SUMMARY OF CRAF SEGMENTS

CRAF Segments	Stages I	Stages II	Stages III
Domestic		7	7
Alaskan		11	11
Short-Range International		34	34
Long-Range International (PAX)	30	75	242
Long-Range International (CARGO)	30	75	149
Aeromedical Evacuation	___	13	13
Total CRAF	60	215	476

Legend:
PAX - Passengers

Source:
AMC HQ Form 312, Civil Reserve Air Fleet (CRAF) Capability Summary, 1 Jul 93.

TABLE 35
STRATEGIC AIR TRANSPORT REQUIREMENTS
C-141/C-17 MIX

Type Unit	Aircraft Type		Passengers Flown	Residual Passengers
	C-141	C-17		
Division:				
Air Assault	1,337	198	8,125	7,208
Airborne	1,010	79	4,430	8,719
Armored	1,752	1,239	16,936	602
Infantry	1,679	525	11,256	5,599
Light Infantry	754	41	6,202	4,611
Mechanized	1,716	1,240	17,176	590
Regiment:				
Armored Cavalry	451	414	4,399	57

Note:
Sortie requirements are based on a 3,000-nautical-mile critical leg with the following ACLs: C-141B, 50,000 lb; C-17, 130,000 lb.

Legend:
ACLs - Allowable cabin loads

Source:
MTMCTEA's Transportability Analysis Reports Generator, using the October 1993 Table of Organization and Equipment and the October 1993 DA standard Equipment Configuration File.

TABLE 36
STRATEGIC AIR TRANSPORT REQUIREMENTS
C-141/C-5 MIX

Type Unit	Aircraft Type		Passengers Flown	Residual Passengers
	C-141	C-5		
Division:				
Air Assault	1,363	117	7,648	8,091
Airborne	1,009	47	4,516	8,633
Armored	1,843	963	15,494	2,044
Infantry	1,613	425	10,698	6,157
Light Infantry	750	23	6,160	4,653
Mechanized	1,905	936	15,702	2,064
Regiment:				
Air Cavalry	489	313	4,301	155

Note:
Sortie requirements based on 3,000-nautical-mile critical leg with the following ACLs: C-5, 150,000 lb; C-141, 50,000 lb.

Legend:
ACLs - Alowable cabin loads

Source:
MTMCTEA's Transportability Analysis Reports Generator, using the October 1993 Table of Organization and Equipment and the October 1993 DA standard Equipment Configuration File.

TABLE 37
MOVEMENT ECHELONS FOR FORCIBLE ENTRY ASSAULT FORCES

	US Army	US Marine Corps
	Light Airborne Forces	Amphibious Forces
	ASSAULT ECHELON (AE)	
Mission:	Initiates Assault	Initiates Assault
Mode:	AMC Airdrop	USN Amphibious Ships
Troops:	Combat/CS/CSS	Combat/CS/CSS
Equipment:	Unit Equipment	Unit Equipment
Supplies:	Accompanying Only	Accompanying Only
	ASSAULT FOLLOW-ON ECHELON (AFOE)	
Mission:	Sustains Assault	Sustains Assault
Mode:	AMC Airland	MSC-Provided
Troops:	CS/CSS	CS/CSS
Equipment:	Unit Equipment	Unit Equipment
Supplies:	Accompanying Only	Accompanying Only
	FOLLOW-UP (FU)	
Mission:	Sustains Operation	Sustains Operation
Mode:	AMC Channel Airlift/ MSC-Provided Ships	AMC Channel Airlift/ MSC-Provided Ships
Troops:	Replacements and Reinforcements	Replacements and Reinforcements
Equipment:	Replacements and Reinforcements	Resupplies
Supplies:	Replacements and Reinforcements	Resupplies

VIII. CONTAINER TRANSPORT

A. GENERAL

This section provides planning information on the use of dry cargo containers, flatracks, and seasheds. It lists and discusses references for current container inventories; container, flatrack, and seashed characteristics; and unit movement requirements. For additional information on containers and to review container doctrine see, FM 55-60, FM 55-15, and MTMC Pamphlet 55-2, Management and Stuffing of Containers.

B. CONTAINER INVENTORY

With such large numbers and types of containers currently in use, it would be impractical to list these assets. The Official Intermodal Equipment Register, published annually by the Intermodal Publishing Company, contains detailed information on container ownership and inventory.

C. CONTAINER CHARACTERISTICS

Table 38 lists typical 20- and 40-foot container dimensions and capacities. Special length and height containers are also listed. Special containers are referenced by the vessels or shipping lines that use or offer them for hire. All figures are average measurements and capacities. Slight variations may be found between manufacturers for the same type of container. The Container System Hardware Status Report, DD-M(A)1592, produced annually by the US Army Belvoir Research, Development, and Engineering Center, gives a good overview of containers and Army equipment associated with containerization.

D. EQUIPMENT QUALIFICATION FOR CONTAINERIZATION

Unit equipment and supplies are qualified for containerization based on the dimensions and weight capacities of the containers given in table 38. For planning purposes all dry cargo configurations (unit equipment, cargo packages, and so forth) to be loaded into a container should be at least 6 inches less in width than the container door opening depicted in table 38. Similarly, the cargo height will be at least 3 inches less than the container door height opening.

Table 38 provides the typical characteristics of commercial dry cargo containers. The table may be used by the planner to decide which pieces of equipment or other items of dry cargo may be loaded into the various container sizes. The critical equipment/package dimension is its width. The height and weight of the equipment or dry cargo package are other important elements for consideration.

TABLE 38
TYPICAL DRY CARGO CONTAINER CHARACTERISTICS

Exterior Dimensions Length x Width x Height (ft-in.)	Interior Dimensions Length x Width x Height (in.)	Door Opening Dimensions Width x Height (in.)	Interior Cubic Feet Capacity	Interior Square Feet	Interior MTON	Maximum Weight Capacity (lb)*
Common to Most Carriers:						
20' x 8' x 8'	231" x 90" x 86"	90" x 84"	1,046	145	27	44,800
20' x 8' x 8'- 6"	231" x 90" x 92"	90" x 89"	1,119	145	28	44,800
40' x 8' x 8'	472" x 90" x 86"	90" x 84"	2,138	296	53	67,200
40' x 8' x 8'- 6"	472" x 90" x 92"	90" x 89"	2,286	296	57	67,200
FSS, Matson, and Sea-Land Also Use:						
35' x 8' x 8'- 6"	415" x 92" x 94"	90" x 90"	2,076	265	52	45,000
American President Lines Also Uses:						
45' x 8' x 8'- 6"	534" x 90" x 92"	90" x 89"	2,587	335	65	64,300
48' x 8' x 9'	570" x 90" x 98"	90" x 95"	2,925	358	73	68,000
Sea Containers: (20' Half-Heights)						
20' x 8' x 4'- 3"	228" x 90" x 41"	(Top Loaded)	609	143	15	44,800

*Actual allowable weight for air and highway transport may be less. For air transport, see MIL-STD-1366C. For highway transport, see appendix A, Summary of Legal Size and Weight Limits, Directory Of Highway Permit Officials and Mobilization Movement Control (MOBCON) Coordinators, Aug 91.

Legend:
FSS - Fast sealift ship

Normally, any piece of equipment that meets the width of the door opening criteria for container loading will satisfy the height, length, and weight limitations for the given container. For example, in the 20-foot by 8-foot by 8-foot 6-inch container, any piece of equipment that is 84 inches or less in width and 86 inches or less in height is a candidate for loading into the container. This would provide a 3-inch margin on top and on each side (or a 6-inch margin on one side) of the item to be loaded. This makes available a margin for aligning the equipment to the door opening, to facilitate the loading process when margins are very close and a possible need for blocking and bracing exists. Analysis has shown that few equipment items that are 84 inches in width (which provides up to a 6-inch margin on one side of the equipment or a 3-inch margin on both sides) are higher than 86 inches in height, longer than 231 inches, or weigh more than 20 STON (40,000 pounds). Multiple equipment items that satisfy the foregoing can be loaded subject to their combined length not exceeding the interior of the container, less linear space for tie-down/blocking and bracing. Each item to be loaded other than unit equipment (particularly non-unit palletized cargo or large boxes, and so forth) should be evaluated on a case-by-case basis. In such cases the item might very well be loadable with its dimensions being only a fraction less than the door opening dimensions and extending to the end of the container, with the only limitation being the capability to close the container door.

If the measurement tons (MTON) of the cargo are needed, use the data in appendix F. In this case, 1 MTON = 40 cubic feet, and 1 cubic foot = 1,728 cubic inches; therefore, 1 MTON = 40 x 1,728 = 69,120 cubic inches. To find the MTON of the cargo, divide the cubic inches of the cargo by 69,120. For example: (220 x 88 x 80 inches)/69,120 = 1,548,800/69,120 = 22.4 MTON.

The 22.4 MTON calculated in the above example do not exceed the 29.0-MTON capacity of a 20-foot by 8.5-foot container.

If the actual MTON or STON are known, the conversion factor for known types of cargo given in appendix G can be used. These figures have been developed over time and should be used only when more accurate data are unavailable.

If the cargo is unidentified TOE with only the MTON known, a 75 percent cube utilization should be assumed. In this case, the container must have a 29.86-MTON capacity (22.4/0.75 =29.86).

E. FLATRACK CHARACTERISTICS

Flatracks are portable, open-top, open-side containers designed largely for ship operations and could be used for inland movement if required. Figures 5 through 7 show various types of flatracks used during deployment. For further information on inland movements, see Section VII, paragraph H, Palletized Load System (PLS). Flatracks have the capability to stow aircraft, vehicles, outsized, and breakbulk cargo that cannot normally be stowed in containers.

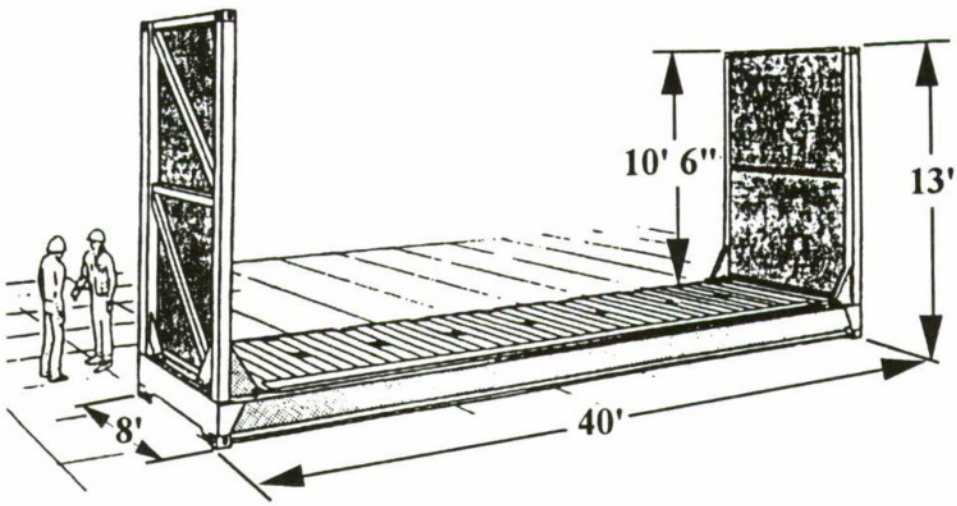


Figure 5. Forty-foot military flatrack.

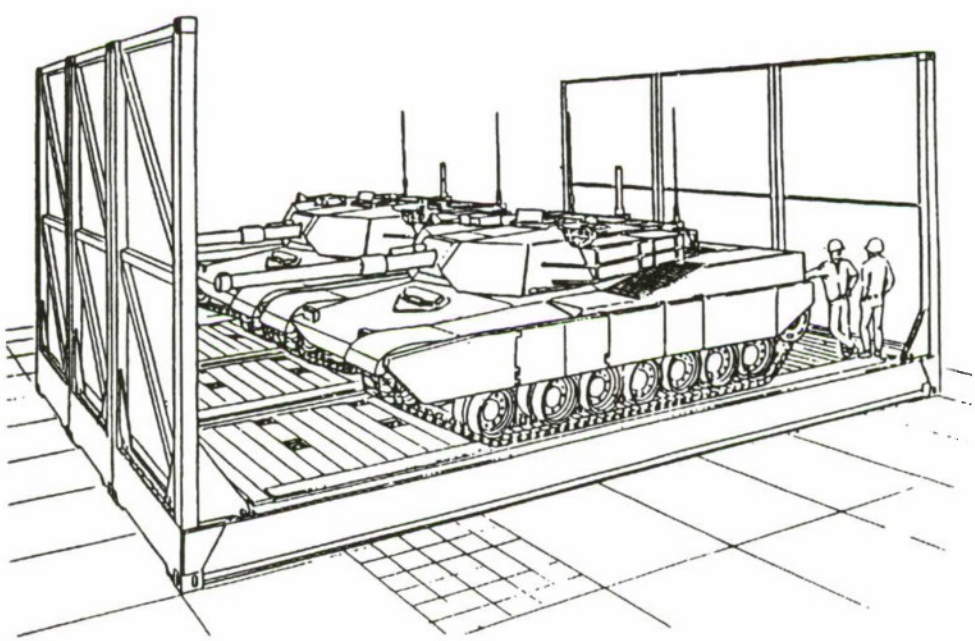


Figure 6. Flatracks used as a temporary 'tween deck.

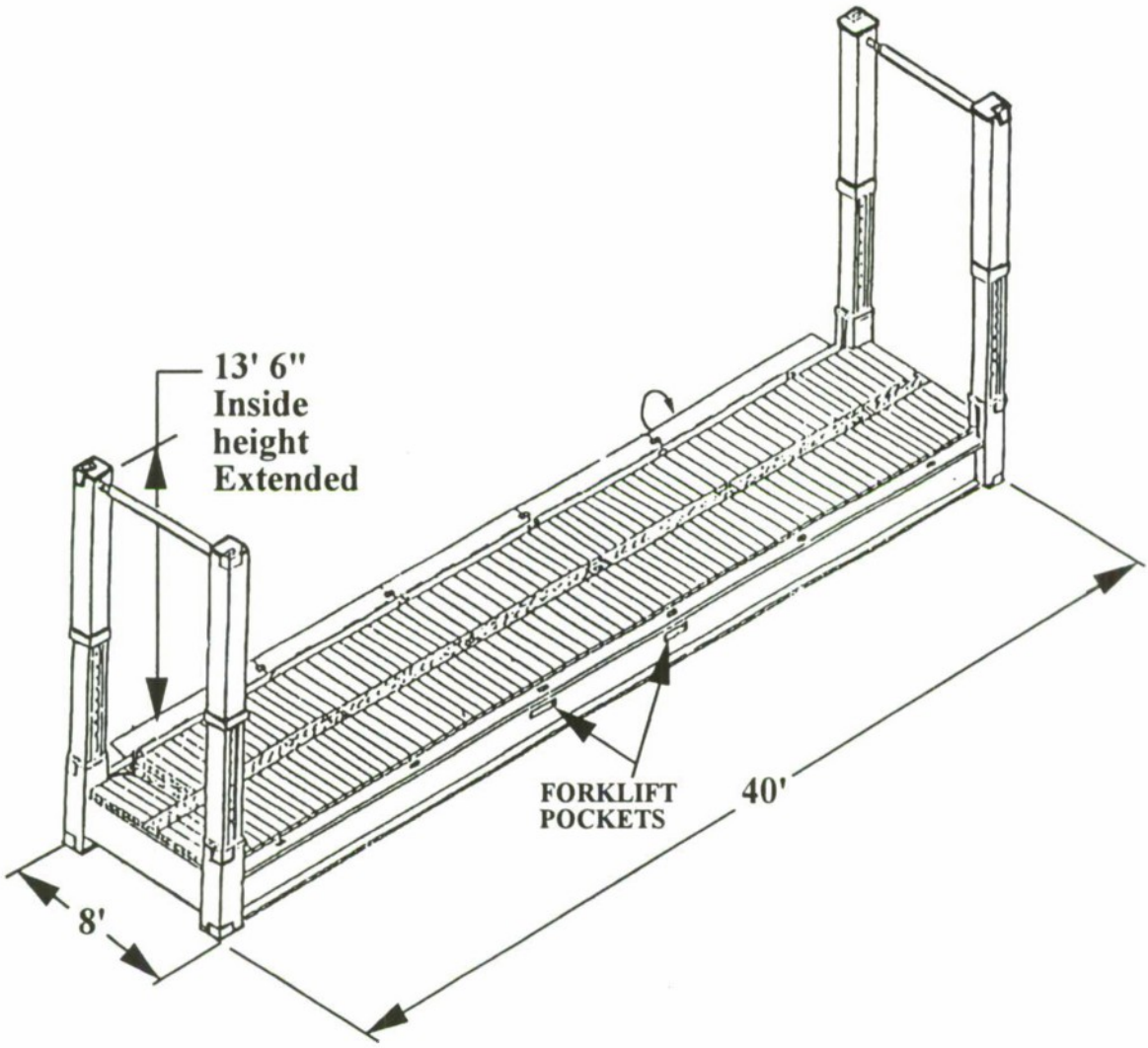


Figure 7. Special-purpose heavy duty flatrack (Titan).

Flatracks may be used as individual units or combined horizontally to create a false deck effect within a containership hold. Military flatracks, when placed side by side, have an integral folding flap that is positioned between the flatracks, to create a flush deck. However, this folding flap is not available on most commercial flatracks. This flap provides the capability to drive from one flatrack to the other or to stow cargo that spans more than one flatrack. Table 39 lists the standard dimensions and capabilities of commercial and military flatracks.

F. SEASHED CHARACTERISTICS

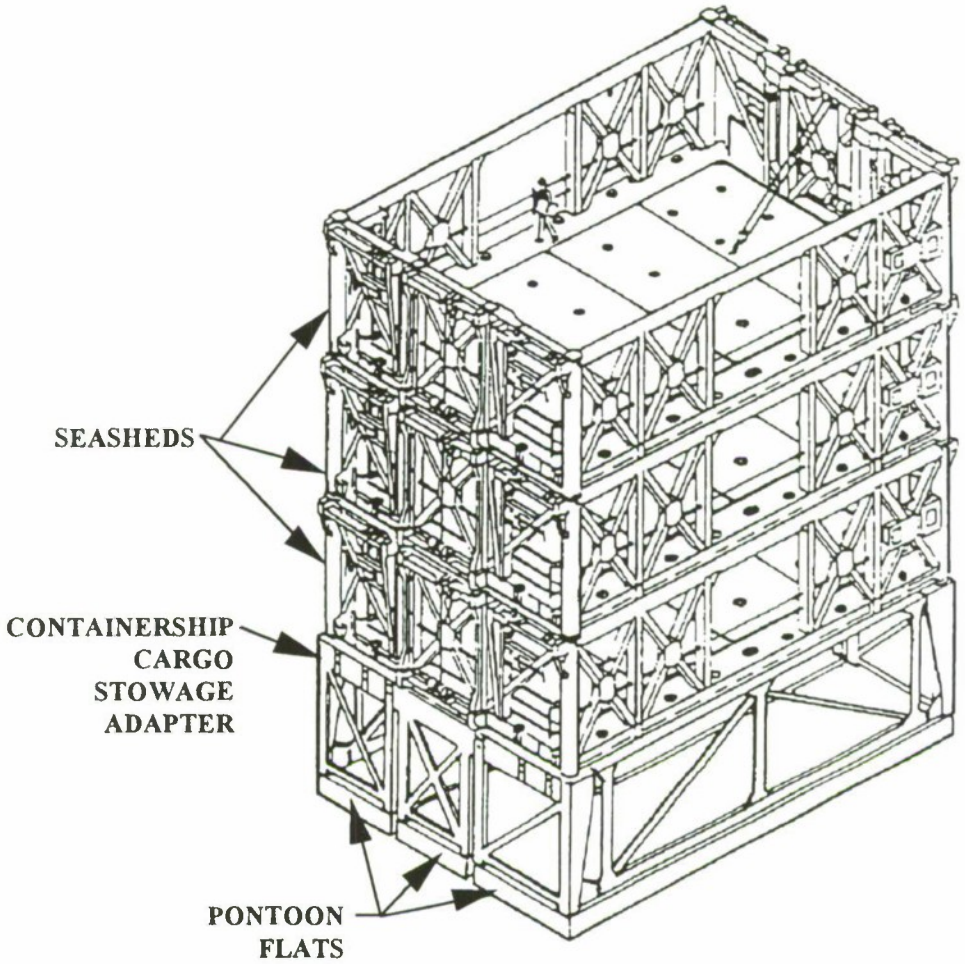
Seasheds are large, open-top cargo containers that fit into the container cells of a containership. Figure 8 shows a typical seashed. They provide the capability to carry heavy or outsized cargo, such as tanks or helicopters, and are well suited to in-stream discharge operations. Each seashed occupies the space (cells) of three 40-foot containers. A seashed set consists of a stack of one to three seasheds that rest upon a containership cargo stowage adapter (CCSA). The CCSA consists of two elements: the adapter frame and three pontoon flats. The CCSA provides the same stowage capability as a seashed. The floor of the seashed opens to allow cargo to be lowered through to the seashed or CCSA below. Table 39 lists the dimensions and cargo capacity of a seashed. MSC currently owns 359 CCSAs and 1,058 seasheds.

For a detailed analysis of flatrack and seashed operations and the movement of unit equipment aboard a commercial containership, see MTMCTEA Report OA 89-4b-33, Display Determination 89 Containership Force Deployment Exercise Afteraction Report, March 1990, and FC 55-50.

G. EQUIPMENT DEPLOYMENT AND STORAGE SYSTEMS (EDSS)

EDSS, as part of the Army containerization master action plan, are standardized unit deployment/storage systems capable of strategic and tactical delivery via both surface and air transportation modes. The two types of EDSS modules are: a ground dominant system (QUADCON), similar to that used by the Marine Corps, to be used by units that deploy by sea, and an air dominant system (ISU), to be used by units that deploy by air. Two systems are required for compatibility with air and ground modes of transportation.

The quadruple container (QUADCON) will be the dominant surface/sea deployment system. The QUADCON is capable of being stacked and locked together into an array of four to form an 8-foot by 20-foot intermodal American National Standards Institute (ANSI)/International Organization for Standardization (ISO) envelope that enhances strategic surface deployment by container ships. Figure 9 shows a single QUADCON and a set of four. The QUADCON can be shipped as a single unit or can be divided into four components for transport by unit organic assets.



Container Characteristics		Container Type	Military	
			FSS	MARAD
Dimensions (in)	Internal	Length	378	432
		Width	262	273.25
		Height	134	130
	External	Lenght	420	480
		Width	306	300
		Height	156	150
	Floor Opening	Width	220	216
		Height	336	360
Weight (lb)	Tare		67,200	76,000
	Payload		220,000	220,000
Quantity			1002	1058
Owner			MSC	MSC

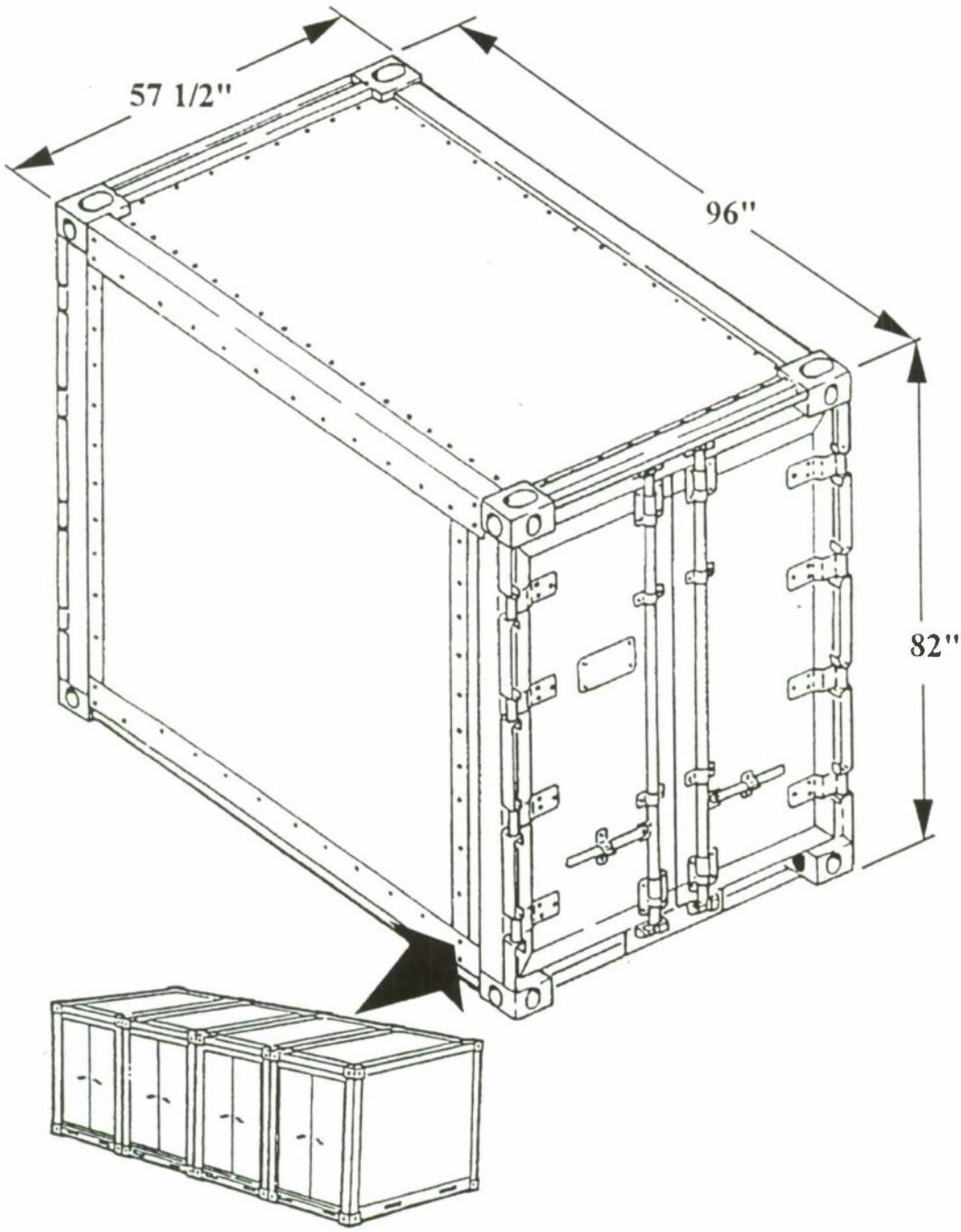
Figure 8. Seashed.

TABLE 39
TYPICAL FLATRACK AND SEASHED CHARACTERISTICS

Exterior Dimensions Length x Width x Height (ft-in.)	Interior Dimensions Length x Width x Height (in.)	Interior Cubic Feet Capacity	Interior Square Feet	Interior MTON	Maximum Weight Capacity (lb)
Commercial Flatracks:					
20' x 8' x 8'- 6"	229" x 96" x 92"	1,170	152	29	49,600
40' x 8' x 8'- 6"	474" x 96" x 76"	2,001	316	50	67,388
24' x 8' x 9'- 6"	268" x 96" x 98"	1,459	179	36	47,150
Military Heavy-Duty Flatrack:					
40' x 8' x 8'- 6"/13'	462" x 96" x 126"	3,234	308	81	134,400
FSS Flatracks:					
35' x 8' x 15'- 3"	405" x 96" x 162"	3,645	270	91	134,000
35' x 8' x 12'	405" x 96" x 123"	2,768	270	69	134,000
35' x 8' x 10'- 3"	405" x 96" x 102"	2,295	270	57	134,000
Seasheds:					
40' x 24' x 12'- 6"	432" x 273" x 130"*	11,000	1,000	275	220,000

*The clear floor opening for a seashed is 360 in. by 216 in.

Legend:
FSS - Fast sealift ship



	EXTERNAL	INTERNAL	DOOR
LENGTH:	96"	90"	
WIDTH:	57 1/2"	53"	52 3/4"
HEIGHT:	82"	76"	70 1/4"
CARGO CAPACITY:		8,000	
GROSS:	10,000 LBS		

Figure 9. Quadruple container (QUADCON).

The air dominant system, internal airlift/helicopter slingable container (ISU), is to be used by units that deploy by air. It is 463L-pallet compatible and will have internal and external air transportation capability. ISU modules will be available in two sizes: 60 inches by 108 inches by 88 inches and 90 inches by 108 inches by 88 inches. Figures 10 and 11 show two typical ISU containers.

The EDSS will be unit owned and authorized by TOE for all component 1, 2, and 3 Army units. The EDSS concept was approved on 30 March 1993 by the Combined Arms Support Command (CASCOM) Review Board, and initial funding for procurement was programmed starting in FY 93.

The owning unit of either type of EDSS will move the modules, using organic ground and air transportation assets. The weight of the modules will not adversely impact the capacity of the prime movers used to transport them. They will be compatible with current and projected military aircraft, the Family of Medium Tactical Wheeled Vehicles, and the Palletized Loading System. The EDSS will also interface with current and proposed automated systems, such as Automated Identification Technologies. Table 40 lists the standard dimensions and capabilities of the EDSS.

H. PALLETIZED LOAD SYSTEM (PLS)

The PLS is an ammunition-hauling tactical wheeled truck and trailer combination with the integral self-load/unload capability of demountable cargo beds (flatracks). The primary mission of the system is the movement of conventional and special ammunition by field artillery and their supportive transportation units throughout the Airland Battlefield. The PLS facilitates the relocation of ammunition stocks by combining the use of flatracks and vehicles in ammunition supply points. The PLS supports the ammunition distribution concept, Manuever-Oriented Ammunition Distribution System (MOADS), in the corps area. For additional information on PLS and MOADS, see TRADOC Pamphlet 525-65, US Army Operations Concept for Class V Support Using the Palletized Load System.

As stated, two PLS configurations exist. The basic configuration (M1075) consists of a truck with accompanying towed trailer (M1076). A second truck configuration (M1074) has the same payload capacity and towed trailer, but incorporates a materials handling crane. The flatrack will be loaded and unloaded off the truck and trailer with the truck's hydraulic load handling system. The two versions of PLS flatracks are the M1077 basic flatrack, shown in figure 12, and the XM1 ISO-compatible palletized loading flatrack (IPF), shown in figure 13.

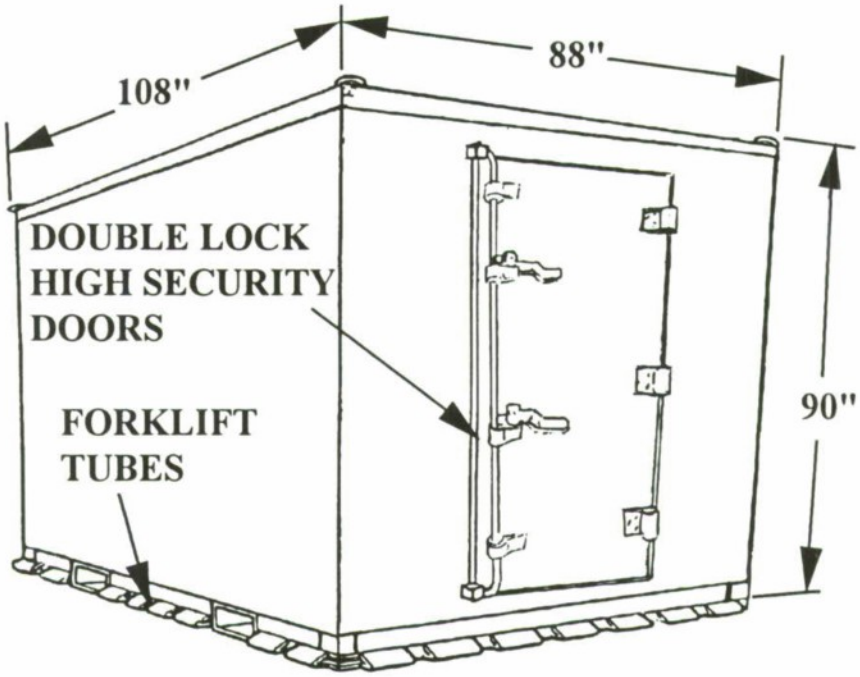


Figure 10. ISU-90-EO single door with weapons rack.

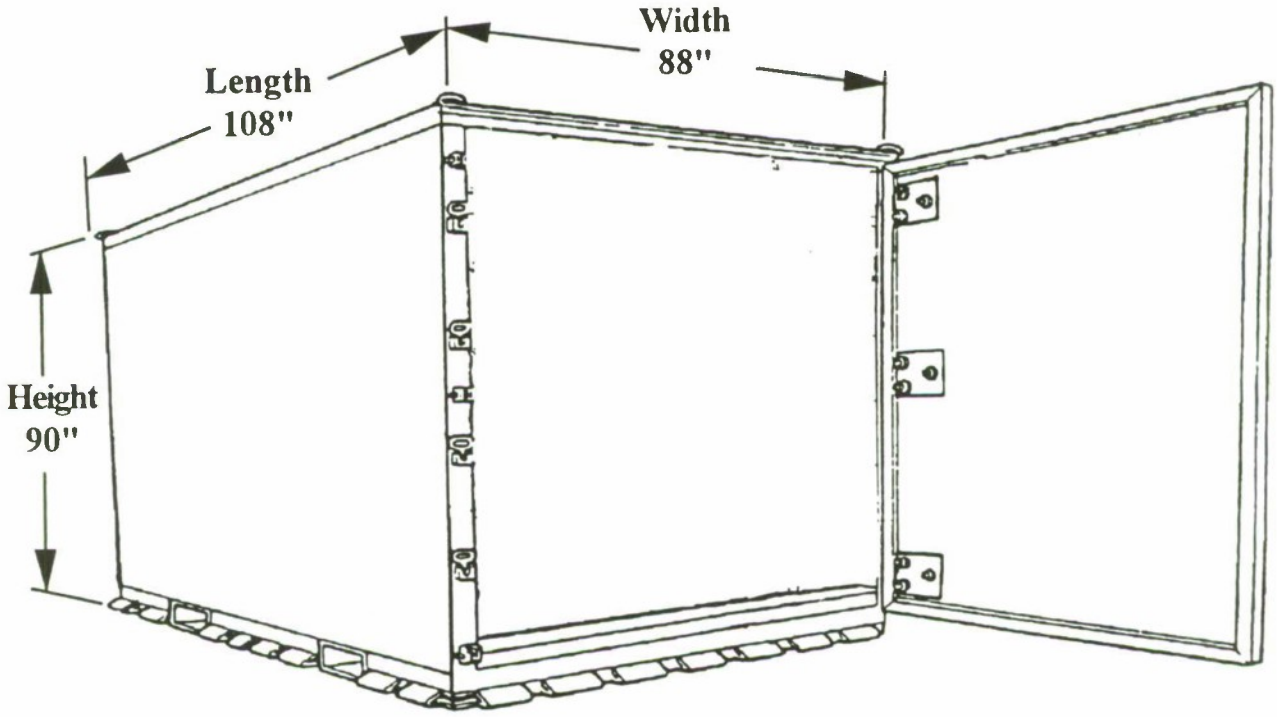


Figure 11. ISU-90-EO single door.

TABLE 40
EQUIPMENT DEPLOYMENT AND STORAGE SYSTEMS (EDSS)

Exterior Dimensions Length x width x height (in.)	Interior Dimensions Length x width x heigth (in.)	Interior Cubic Feet Capacity	Interior Square Feet	Interior MTON	Maximum Weight Capacity (lb)
QUADCON:					
Single					
96" x 57" x 82"	90" x 53" x 76"	209	34.23	5.26	8,000
ISU:					
60" x 108" x 88"	54" x 102" x 82"	261	38.25	6.25	10,000
90" x 108" x 88"	84" x 102" x 82"	396	59.50	9.90	10,000

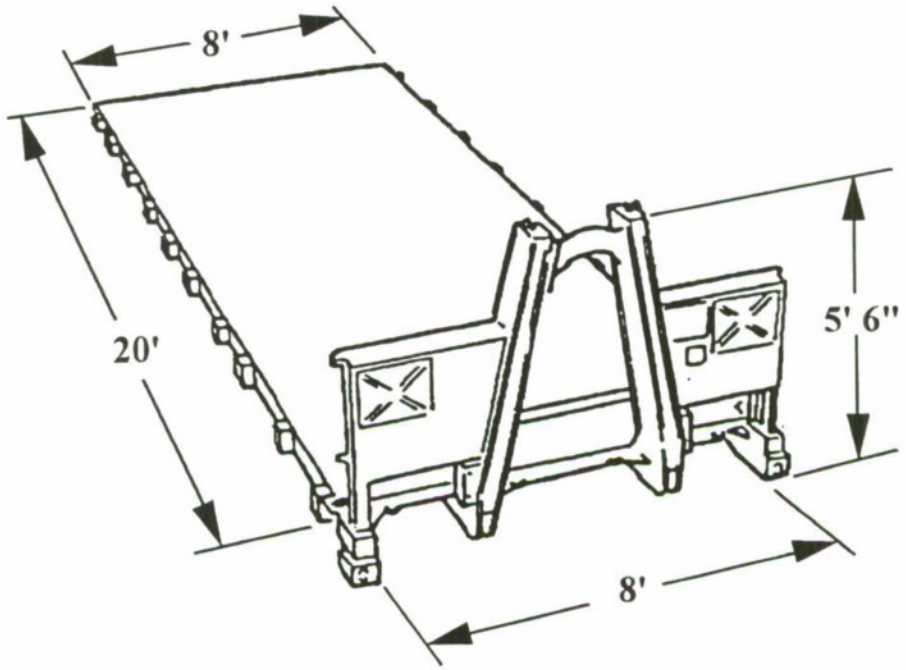


Figure 12. Palletized loading system (PLS) flatrack (M1077).

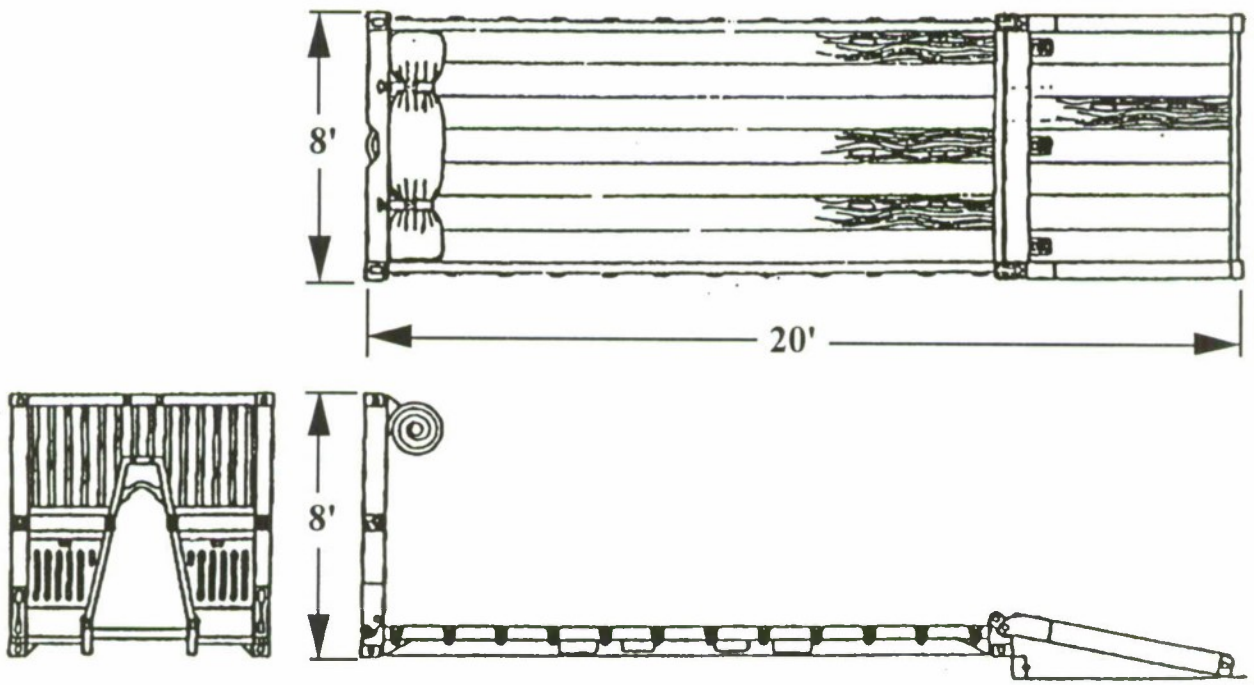


Figure 13. XM1 ISO-compatable palletized loading flatrack (IPF).

The M1077 flatrack is a 20-foot-long by 8-foot-wide by 5-foot 7-inches-high sideless platform, built in accordance with tripartite (UK, GER, US) agreement standards. The M1077 has a tare weight of 3,190 pounds and a payload capacity of 33,000 pounds. The flatrack is NATO-interoperable, but does not have intermodal capability. The M1077 can be transported on M871 and M872 semitrailers and can transport a 20-foot ISO container.

The XM1 IPF is a 20-foot-long by 8-foot-wide by 8-foot-high sideless container, built to ISO and tripartite standards. The flatrack has inward collapsing endwalls and an outward folding rear endwall that forms a vehicular ramp. An outward half-folding hook-bar endwall will allow for unloading capability of the Multiple Rocket Launch System rocket pods. The tare weight of the EPF is estimated at 7,800 pounds. In PLS mode, the flatrack has a maximum payload capacity of 28,500 pounds. For intermodal transport, the XM1 IPF can transport a maximum payload of 30,700 pounds. The XM1 IPF is NATO-interoperable and capable of fully intermodal transport.

CASCOM is currently conducting a Combat Service Support Battle Lab study to define follow-on uses for PLS. Some emerging applications for consideration are petroleum, oils, and lubricants; water; and movement of medical shelters.

I. UNIT MOVEMENT REQUIREMENTS

Table 41 lists the quantity of unit equipment, per Army-type division and armored cavalry regiment that can be containerized. Included is the number of 20-foot container equivalent units required to move this equipment. Both the 20-foot container and 40-foot heavy-duty military flatrack were used to simulate containerized loading of unit equipment. Another option, not shown, is to use 40-foot flatracks, arranged up to three abreast, to allow for loading of all unit equipment, including the M1A1, on container ships. This option and the one shown in tables 20 and 41 are not the preferred methods of sea transport. They are addressed for reference purposes as alternative methods of deployment, when preferred methods are not available.

TABLE 41
CONTAINERIZABLE UNIT EQUIPMENT

Type Unit	Total Square Feet	Total STON	Total MTON	Containerizable Equipment			Number of TEUs
				Square Feet	STON	MTON	
Division:							
Air Assault	1,034,669	35,889	175,682	824,000	30,600	135,300	6,533
Airborne	733,750	24,144	110,691	658,900	21,500	96,000	5,010
Armored	1,538,468	108,708	302,263	928,400	43,000	166,500	7,206
Infantry	1,187,603	66,073	219,806	850,700	37,900	148,300	6,573
Light Infantry	463,939	16,420	73,314	395,500	13,800	60,900	3,369
Mechanized	1,543,868	107,777	303,342	938,100	43,500	168,500	7,277
Regiment:							
Armored Cavalry	439,231	32,976	87,047	246,100	12,200	45,100	1,825

Note:
The Container Stuffing Model of TARGET*Plus determines what unit equipment can be loaded into standard 20-ft containers and 40-ft flatracks. Maximum containerization simulates containerization of all eligible equipment, vehicles, and helicopters. 20-ft container (20' length x 8' width x 8' height exterior dimensions) eligible cargo dimensions: 225 in. long by 84 in. wide by 81 in. high. 40-ft flatrack eligible cargo dimensions: 462 in. long by 96 in. wide by 126 in. high.

Legend:
TEU - 20 ft equivalent unit

Source:
MIMCTEA's Transportability Analysis Reports Generator, using the October 1993 Table of Organization and Equipment and the October 1993 DA standard Equipment Configuration File.

IX. INLAND WATERWAY TRANSPORT

A. GENERAL

This section provides information about the national inland waterway system. In light of recent successful inland waterway moves by Army armored, artillery, and engineer units, the information presented is an effort to make planners aware of this practical and very feasible transport option. Because of the limited amount of inland waterway data available for analysis, the data listed are more comparative than analytical in nature.

The following topics about inland waterways are discussed in this section: background information and the role of the Army Corps of Engineers, characteristics and quantities of barges, barge transit data, and unit movement requirements.

B. BACKGROUND

1. Inland Waterway System Characteristics

The contiguous States are served by about 25,000 miles of inland and coastal waterways. This waterway system consists of several key segments shown in figure 14. These segments include inland rivers, the lower Mississippi River, Great Lakes, and offshore coastal shipping lanes. However, the traditional view of the inland waterway system is inland rivers and the lower Mississippi River.

Upper inland rivers average 9 feet in depth. This depth is maintained by the use of locks and dams. No locks or dams are needed for flow augmentation of the Mississippi River, where depths can reach 27 feet. Of the 25,000 miles of inland waterways, 15,500 miles can be served with a 5-foot draft. Since a loaded, flat-deck barge draws less than 5 feet, such barges can transit all major segments of the inland waterway system. The drafts of barges used to transport military equipment average 3 feet.

2. Inland Waterway Access

Eighty-five military installations are within 100 miles of a navigable waterway, for which the use of the inland waterway system may represent a viable transport option. Of course, this option is the most viable for those installations that actually, or nearly, abut to such waterways. For example, 48 military installations are designated as mobilization stations. Eleven of these have some sort of access to the inland waterway system. Table 42 lists these installations and their respective distances from an inland waterway dock. The remaining 37 installations either have no access to the system or are already close to an SPOE.

Figure 14. Inland waterway routes.

TABLE 42
MOBILIZATION STATION TO INLAND WATERWAY DOCK MILEAGE

Installation	Installation Location	Inland Waterway Dock Location	Miles to Dock	Waterway Serving Dock
Camp Atterbury	Columbus, IN	Louisville, KY	80	Ohio River
Camp Grayling	Grayling, MI	Traverse City, MI	52	Lake Michigan
Camp Ripley	Little Falls, MN	Little Falls, MN	126	Mississippi River
Camp Robinson	Little Rock, AR	Little Rock, AR	5	Arkansas River
Fort Campbell	Clarksville, KY-TN	Clarksville, KY-TN	15	Cumberland River
Fort Chaffee	Fort Smith, AR	Fort Smith, AR	10	Arkansas River
Fort Drum	Watertown, NY	Oswego, NY	80	Erie Canal
Fort Knox	Muldraugh, KY	Louisville, KY	27	Ohio River
Fort McCoy	Sparta, WI	Lacrosse, WI	30	Mississippi River
Fort Riley	Junction City, KS	Kansas City, MO	118	Missouri River
Gowen Field	Boise, ID	Lewiston, ID	200	Snake River

3. Advantages of the Inland Waterway System

Some distinct advantages associated with using the inland waterway system for the movement of unit equipment include:

a. Abundance of waterway transport assets.

b. Reduced time, effort, and materials for loading/offloading, in comparison with rail transport resulting from RORO capability.

c. Unimproved loading sites as well as improved loading docks can be used.

d. Simultaneous loading of barges.

e. Minimum lashing gear requirements.

f. No dimensional or weight restrictions on individual pieces of cargo.

g. No reduction and restricted fuel requirements for vehicles.

h. Enhanced security; less threat of theft and vandalism.

4. Army Corps of Engineers

The Army Corps of Engineers is the single agency manager of the national inland waterway system. This role includes the operation and maintenance of 258 locks, 220 main facilities, and 170 dams for navigation purposes.

5. References

All data, conclusions, and assumptions found in this section are findings taken directly from the limited number of inland waterway movements of unit equipment that have taken place thus far. Sources include reports, briefings, interviews, unit lessons learned, and afteraction reports. For detailed information concerning inland waterway operations, see US Army Corps of Engineers Reports: Interim Report, Military Waterborne Movement, September 1987; IWR Report 88-R-7, The 1988 Inland Waterway Review, November 1988; and CY 1989 Estimated Waterborne Commerce Statistics National Totals and Inland Waterways, June 1990. MTMC sources include: HQMTMC Inland Traffic Directorate Report, Military Utilization of The Inland Waterway System, August 1990, and MTMCTEA Report OA 77-11, An Analysis of CONUS Inland Waterways for National Defense, September 1978. Information concerning inland waterways is also contained in FM 55-50.

C. TRANSPORT ASSETS

The inland waterway system is served by about 800 companies that operate about 31,000 barges and 5,188 tow and tugboats. Of these waterway transport assets, the most militarily useful are flat-deck barges. Table 43 provides an inventory and the characteristics of these barges.

D. TRANSIT DATA

1. Sample Loading Averages

Average loading rates for the actual unit movements examined are as follows:

a. Two barges loaded per hour.

b. Thirty-three pieces of equipment per hour.

c. Twenty-three pieces of equipment per barge.

2. Sample Speeds

The transit speed for these same unit moves depended upon the direction of travel. For travel up river, speeds averaged between 5 and 6 mph, while down-river speeds averaged between 7 and 8 mph. Average lockage time is 25 minutes. Towboats in transit operate on a 24-hour continuous basis.

E. UNIT MOVEMENT REQUIREMENTS

Not enough data currently exist to determine the number of barges required to move the six Army-type divisions and armored cavalry regiment, as shown in the four other transport sections. Instead, the assets used during actual unit moves are shown in table 44. These figures can only be used for comparative purposes.

TABLE 43
INVENTORY OF FLAT-DECK BARGES

Average Length (ft)	Number of Barges	Average Capacity (STON)	Average Capacity (Sq Ft)
< 160	1,888	531	4,827
160-180	152	1,477	7,359
180-200	726	1,345	7,117
200-220	135	2,090	9,808
220-250	70	3,293	13,680
> 250	117	5,040	17,100

TABLE 44
UNIT MOVEMENT REQUIREMENTS - INLAND WATERWAY

Battalion-Size Unit	Pieces of Equipment	Total STON	Number of Barges
Infantry	141	480	7
Tank	230	4,309	9
Armored Cavalry	252	1,033	9
Mechanized Infantry	276	1,539	9
Engineer	356	2,603	13
Combat Engineer	562	5,232	21

APPENDIX A

REFERENCES

1. JOINT SERVICE PUBLICATIONS

Joint Pub 1	Joint Warfare for the US Armed Forces
Joint Pub 0-1	Basic National Defense Doctrine
Joint Pub 0-2	Unified Action Armed Forces (UNAAF)
Joint Pub 1-01	Joint Publication System, Joint Doctrine and JTTP Development
Joint Pub 1-06	Joint Symbols and Graphics
Joint Pub 3-0	Doctrine for Joint Operations
Joint Pub 3-02	Joint Doctrine for Amphibious Operations
Joint Pub 3-02.1	Joint Doctrine for Landing Force Operations
Joint Pub 3-02.2	Joint Doctrine for Amphibious Embarkation
Joint Pub 3-04.1	JTTP for Shipboard Helicopter Operations
Joint Pub 3-17	JTTP for Theater Airlift Operations
Joint Pub 4-0	Doctrine for Logistics Support of Joint Operations
Joint Pub 4-01.1	JTTP for Airlift Support to Joint Operations
Joint Pub 4-01.2	JTTP for Sealift Support to Joint Operations
Joint Pub 4-01.3	JTTP for Joint Movement Control
Joint Pub 4-01.4	JTTP for Water Terminal Operations
Joint Pub 4-01.6	JTTP for Joint Logistics Over the Shore
Joint Pub 4-01.7	JTTP for Use of Intermodal Containers in Joint Operations
Joint Pub 4-05	Mobilization
Joint Pub 5-0	Doctrine for Planning Joint Operations
Joint Pub 5-00.1	JTTP for Campaign Planning

Joint Pub 5-00.2	Joint Task Force Planning Guidance and Procedures
Joint Pub 5-03.1	Joint Operation Planning and Execution System Vol 1: Planning Policies and Procedures
AFSC Pub 1	The Joint Staff Officers Guide

2. AIR FORCE PUBLICATIONS

AFP 76-2	Airlift Planning Factors
AFP 76-19	Certification of Military Equipment for Transport in MAC/CRAF Aircraft
AFSC HB 1-11 Transportability	AFSC Design Handbook; Air

3. AIR MOBILITY COMMAND

AMC Reg 55-8	Civil Reserve Air Fleet (CRAF) Operations
AMC Pam 55-41	Civil Reserve Air Fleet (CRAF) Load Planning Guide

4. ARMY FIELD MANUALS

FM 55-2	Division Transportation Operations
FM 55-9	Unit Air Movement Planning
FM 55-10	Movement Control in a Theater of Operations
FM 55-12	Movement of Units in Air Force Aircraft
FM 55-15	Transportation Reference Data
FM 55-30	Army Motor Transport Units and Operations
FM 55-50	Army Water Transport Operations
FM 55-60	Army Terminal Operations
FM 55-65	Strategic Deployment by Surface Transportation
FM 55-312	Military Convoy Operations in CONUS

FM 101-10-1/2	Staff Officers Field Manual, Organization, Technical, and Logistical Data
FM 101-20	United States Army Aviation Planning

5. ARMY REGULATIONS

AR 55-4	CONUS Military Installation Materiel Outloading and Receiving Capability Report (Report Control Symbol MTMC-7) (R-2)
AR 55-29	Military Convoy Operations in CONUS
AR 55-60	Transportation and Travel Official Table of Distances
AR 55-113	Movement of Units Within Continental United States
AR 55-162	Permits for Oversize, Overweight, or Other Special Movements on Public Highways in the United States
AR 55-355	Defense Traffic Management Regulation
AR 55-355 Vol 2	Transportation Facilities Guide, US Army
AR 55-355 Vol 3	Transportation Facilities Guide, US Navy, Marine Corps, and Coast Guard
AR 55-359	Terminal Facilities Guide, US Air Force
AR 220-10	Preparation for Oversea Movement of Units
AR 700-120	Materiel Distribution Management

6. ARMY TECHNICAL BULLETINS

TB 55-45	Certification of Military Equipment for Transport in MAC/CRAF Aircraft (Microfiche) (AFP 76-19)
TB 55-46-1	Standard Characteristics (Dimensions, Weight, and Cube) for Transportability of Military Vehicles and Other Outsize/ Overweight Equipment (In TOE Line Item Number Sequence)
TB 55-46-2	Standard Transportability Characteristics (Dimensions, Weight, and Cube) for Military Vehicles and Equipment

7. ARMY TECHNICAL MANUALS

TM 55-603	Movement of Military Impedimenta by Commercial Carriers (NAVSUPINST 4600.24B; AFR 75-5; MCO P4600.24C)
TM 55-1520-237-23-2	Aircraft General Information Manual, UH-60A Helicopter (AVUM and AVIM)
TM 55-1520-400-14	Transportability Guidance, Marine Transport of US Army Helicopters
TM 55-2200-001-12	Application of Blocking, Bracing, and Tiedown Materials for Rail Transport

8. MARINE CORPS REFERENCES

FMFM 4-9	Motor Transport
FMFM 4-6	Movement of Units in Air Force Aircraft
FMFM 4	Combat Service Support
FMFM 3-1	Command and Staff Action
FMFRP 14-7	Over-the-Horizon (OTH) Amphibious Operations Operational Concept
FMFRP 1-11	Fleet Marine Force Organization
FMFRP 1-18	Amphibious Ships and Landing Craft Data Book
MCO 4610.35D	Marine Corps Equipment Characteristics File
NavSea-OP 5	Ammunition Afloat
NavSea-OP 4550	Handling and Storage of Amphibious Assault Ammunition Aboard Amphibious Ships
NavSea-OP 4	Ammunition Afloat
NWP 22-8	Military Sealift Command Support of Amphibious Operations
NWP 22-5	Naval Beach Group
NWP 22-3	Ship-to-Shore
OH 7-8	Deployment of the Assault Follow-on Echelon (AFOE)

OH 4-3	Landing Support
OH 4-1	Combat Service Support Operations
OH 7-6	Maritime Prepositioning Force (MPF)
TM 11240-15/4A	Motor Transport Technical Characteristics Manual
TM 11275-15/3C	Principal Technical Characteristics of US Marine Corps Engineer Equipment

9. DEFENSE MAPPING AGENCY

Pub 150	World Port Index
Pub 151	Distance Between Ports

10. MARAD PUBLICATIONS

MAR-743	Reserve Inventory Highlights
Unnumbered	A Shipper's Guide to Stowage of Cargo in Marine Containers
Unnumbered	Characteristics and Index of Maritime Administration Ship Designs
Unnumbered	Merchant Fleets of the World
Unnumbered	Ships in the Ready Reserve Force
Unnumbered	US Merchant Marine Data Sheet
Unnumbered	Vessel Inventory Report

11. MSC PUBLICATIONS

MSC P504	Military Sealift Command Ship Register
MSC Rpt 3110-4	Military Sealift Command Force Inventory

12. MTMC PUBLICATIONS

MTMC Reg 56-69	Terminal Operations
MTMCTEA Rpt	Unit Movement Requirement Simulation Model for OA-88-4a-33 Sealift

MTMCTEA Rpt OA 88-5c-18	Analysis of Containerization on Unit Strategic Deployment
MTMCTEA Rpt OA 89-4b-33	Display Determination 89 Containership Force Deployment Exercise Afteraction Report
MTMCTEA Rpt OA 90-4f-22	Deployment Planning Guide
MTMCTEA Rpt OA 91-4a-26	Rail Deployment At CONUS Installations, Operation Desert Storm
MTMCTEA Rpt SE 89-4b-27	Strategic Highway Corridor Network
MTMCTEA Rpt SE 89-4b-59	Strategic Highway Corridor Network (STRAHNET) Connector Atlas
MTMCTEA Rpt SE 90-3d-31	Ports for National Defense, an Analysis of Unit Deployments Through US Ports
MTMCTEA Ref 92-55-20	Tiedown Handbook for Truck Movements
MTMC Pam 55-3	Barge-Ship Systems: Description, Guidance, and Transporting of Military Cargo
MTMCTEA Pam 55-19	Tiedown Handbook for Rail Movements
MTMCTEA Pam 56-1	Marine Terminal Lifting Guidance
MTMCTEA Pam 70-1	Transportability For Better Strategic Mobility
MTMCTEA Pam 700-4	Vessel Characteristics Pamphlet for Shiploading
Unnumbered	Directory of Highway Permit Officials and Mobilization Movement Control (MOBCON) Coordinators

13. MISCELLANEOUS PUBLICATIONS

DD-M(A)1592	1991 Container System Hardware Status Report
FC 55-50	Fast Sealift Ship Users' Manual
FORSCOM/ARNG Reg 55-1	Unit Movement Planning

FORSCOM Reg 55-2	Unit Movement Data Reporting and Systems Administration
MIL-HDBK-138	Container Inspections
MIL-STD-1366C	Transportability Criteria
MIL-STD-1791	Designing for Internal Aerial Delivery in Fixed-Wing Aircraft
Unnumbered	US Army Aircraft Delivery Procedures (Instructions For Delivery Pilots)
Unnumbered	Official Intermodal Equipment Register
Unnumbered	Official Railway Equipment Register
Unnumbered	Guide to Port Entry, 1991-92
Unnumbered	Jane's Containerization Directory
Unnumbered	Lloyd's List of Ship Owners
Unnumbered	Lloyd's Maritime Guide
Unnumbered	Lloyd's Register of Ships
Unnumbered	Maritime Directory and Industry Census

APPENDIX B

ABBREVIATIONS AND ACRONYMS

ACC	Air Combat Command
ACL	Allowable Cabin Load
AE	Assault Echelon
AFOE	Assault Follow-on Echelon
AMC	Air Mobility Command
AOA	Amphibious Objective Area
APF	Afloat Pre-positioning Force
APOD	Aerial Port of Debarkation
APOE	Aerial Port of Embarkation
ALD	Available-to-Load Date
AS	Assault Shipping
ATF	Amphibious Task Force
BB	Breakbulk
CDS	Container Delivery System
CHE	Container Handling Equipment
CINC	Commander in Chief
CL	Carload
CMC	Commandant of the Marine Corps
Cml	Commercial
CONUS	Continental United States
CRAF	Civil Reserve Air Fleet
CS	Combat Support
CSM	Container Stuffing Model
CSS	Combat Service Support
CuFt	Cubic Foot
DA	Department of the Army
DEST	Destination
DFRIF	Defense Freight Railway Interchange Fleet
DMC	Defense Movement Coordinator
DOA	Days of Ammunition
DOD	Department of Defense
DOS	Days of Supply
DOT	Department of Transportation
DTO	Division Transportation Office(r)
DTS	Defense Transportation System
EAD	Earliest Arrival Date
EDD	Earliest Departure Date
EmbO	Embarkation Officer
EDSS	Equipment Deployment and Storage System
EPF	Enhanced PLS Flatrack
FLOFLO	Float On/Float Off
FORSCOM	Forces Command
FSS	Fast Sealift Ship
FU	Follow Up
HET	Heavy-Equipment Transporter
HL	Heavy Lift
HQ	Headquarters
HQMC	Headquarters, Marine Corps
HQMTMC	Headquarters, Military Traffic Management Command

ICC	Interstate Commerce Commission
ISO	International Standards Organization
ISU	Internal Airlift/Helicopter Slingable Container
ITB	Integrated Tug and Barge Unit
ITO	Installation Transportation Office(r)
JCS	Joint Chiefs of Staff
JDC	Joint Deployment Community
JOPES	Joint Operation Planning and Execution System
LAD	Latest Arrival Date
LASH	Lighter Aboard Ship
LHA	Amphibious Assault Ship (General Purpose)
LHD	Amphibious Assault Ship (Multipurpose)
LKA	Amphibious Cargo Ship
LOLO	Lift On/Lift Off
LPD	Amphibious Transport Dock
LPH	Amphibious Assault Ship (Helicopter)
LSD	Dock Landing Ship
LST	Tank Landing Ship
LVS	Logistics Vehicle System
MTON or M/T	Measurement Ton
MACOM	Major Army Command
MARAD	Maritime Administration
MCAGCC	Marine Corps Air-Ground Combat Center
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCCDC	Marine Corps Combat Development Center
MCLB	Marine Corps Logistics Base
MEB	Marine Expeditionary Brigade
MEF	Marine Expeditionary Force
MEU	Marine Expeditionary Unit
MHE	Materials Handling Equipment
MOADS	Maneuver-Oriented Ammunition Distribution System
MOBCON	Mobilization Movement Control
MPF	Maritime Pre-positioning Force
MPS	Maritime Pre-position Ship
MSC	Military Sealift Command
MTM	Millions of Ton Miles
MTMC	Military Traffic Management Command
MTMCTEA	Military Traffic Management Command Transportation Engineering Agency
NGB	National Guard Bureau
OPLAN	Operation Plan
PLS	Palletized Loading System
PND	Ports for National Defense
POD	Port of Debarkation
POE	Port of Embarkation
QUADCON	Quadruple Container
RDD	Required Delivery Date
RLD	Ready-to-Load Date
R/NG	Reserve/National Guard
RORO	Roll On/Roll Off
RRF	Ready Reserve Force

STON or S/T	Short Ton
SC	Sideless Container
SEABEE	Sea Barge
SMO	Strategic Mobility Officer
SOP	Standing Operating Procedure
SPOD	Sea Port of Debarkation
SPOE	Sea Port of Embarkation
Sq ft	Square Foot
SSF	Strategic Sealift Force
STRAHNET	Strategic Highway Network
T-ACS	Auxiliary Crane Ship
TARGET	Transportability Analysis Reports Generator
TAVB	Aviation Logistics Support Ship
TCC	Transportation Component Command
TEU	Twenty-Foot Equivalent Unit
TL	Truckload
TMO	Traffic Management Office(r)
TPFDD	Time-Phased Force and Deployment Data
UMLER	Universal Machine Language Equipment Register
USTRANSCOM	United States Transportation Command

APPENDIX C

SURFACE (LAND) MILEAGE BETWEEN CONUS MILITARY ACTIVITIES AND MAJOR US PORTS

NOTE:
Distances contained in these mileage tables represent the shortest highway route between the CONUS military activities and major US ports.

TABLE C-1
SURFACE (LAND) MILEAGE BETWEEN CONUS
MILITARY ACTIVITIES AND MAJOR NORTH ATLANTIC PORTS

	Bayonne, NJ	Philadelphia, PA	Baltimore, MD	Norfolk, VA
ALABAMA				
Anniston Depot	922	840	744	653
Fort McClellan	910	828	731	648
Fort Rucker	1,048	966	870	748
Maxwell AFB	1,004	922	826	723
Redstone Arsenal	911	829	733	697
ARIZONA				
Davis-Monthan AFB	2,360	2,304	2,228	2,258
Fort Huachuca	2,348	2,292	2,216	2,245
Luke AFB	2,403	2,347	2,271	2,336
Yuma MCAS	2,549	2,493	2,417	2,483
ARKANSAS				
Camp Robinson	1,221	1,139	1,043	1,022
Fort Chaffee	1,323	1,267	1,181	1,160
Little Rock AFB	1,210	1,135	1,039	1,018
Pine Bluff Arsenal	1,241	1,159	1,062	1,041
CALIFORNIA				
Alameda Nav Fac	2,889	2,846	2,778	2,917
Beale AFB	2,805	2,762	2,694	2,832
Camp Roberts	2,893	2,837	2,761	2,827
Castle AFB	2,854	2,810	2,740	2,874
Fort H. Liggett	2,922	2,867	2,791	2,856
Fort Irwin	2,665	2,609	2,533	2,599
Fort Ord	2,964	2,920	2,850	2,927
Letterman AMC	2,898	2,855	2,787	2,925
McClellan AFB	2,801	2,757	2,690	2,828
El Toro MCAS	2,741	2,685	2,609	2,675
MCAGCC 29 Palms	2,622	2,566	2,490	2,556
Camp Pendleton	2,736	2,680	2,604	2,670
Barstow MCLB	2,642	2,587	2,511	2,576
San Diego MCRD	2,727	2,671	2,595	2,660
Lemoore NAS	2,870	2,814	2,738	2,803
Los Alamitos NAS	2,747	2,692	2,616	2,681
Miramar NAS	2,726	2,670	2,594	2,660
Moffett Fld NAS	2,919	2,876	2,808	2,947
Long Beach NSC	2,756	2,700	2,624	2,689
San Diego NSC	2,727	2,671	2,595	2,660
Concord NWS	2,877	2,833	2,766	2,904
March AFB	2,766	2,703	2,644	2,637

TABLE C-1 - cont

	Bayonne, NJ	Philadelphia, PA	Baltimore, MD	Norfolk, VA
CALIFORNIA (cont)				
Seal Beach NWS	2,746	2,690	2,614	2,679
Oakland Base	2,888	2,845	2,778	2,916
Presidio of Mont	2,971	2,928	2,857	2,931
Presidio of SF	2,898	2,855	2,787	2,925
Riverbank AAP	2,840	2,797	2,726	2,861
Sacramento Depot	2,813	2,769	2,702	2,840
Sharpe Depot	2,853	2,809	2,742	2,880
Sierra Depot	2,727	2,684	2,616	2,755
Tracy Def Depot	2,867	2,823	2,756	2,894
Travis AFB	2,850	2,806	2,739	2,877
COLORADO				
Camp West	1,746	1,690	1,614	1,749
Fitzsimons AMC	1,730	1,674	1,599	1,733
Fort Carson	1,746	1,690	1,615	1,731
Peterson AFB	1,737	1,681	1,606	1,722
Pueblo Depot	1,752	1,696	1,621	1,726
Rocky Mtn Arsenal	1,729	1,674	1,598	1,732
WASH DC				
Bolling AFB	220	138	42	183
Fort McNair	220	138	42	185
Walter Reed AMC	216	134	37	190
FLORIDA				
Camp Blanding	959	877	782	643
Eglin AFB	1,135	1,053	957	838
Homestead AFB	1,289	1,207	1,112	974
MacDill AFB	1,118	1,036	941	802
Jacksonville NAS	935	853	758	619
Pensacola NAS	1,168	1,086	989	886
Key West NAS	1,427	1,345	1,250	1,111
Mayport Naval Station	935	854	759	620
Patrick AFB	1,093	1,011	916	778
Tyndall AFB	1,124	1,043	948	821
Whiting Fld NAS	1,133	1,051	955	852
GEORGIA				
Dobbins AFB	841	759	663	560
Fort Benning	953	871	775	661

TABLE C-1 - cont

	Bayonne, NJ	Philadelphia, PA	Baltimore, MD	Norfolk, VA
GEORGIA - cont				
Fort Gillem	847	765	669	566
Fort Gordon	755	673	578	451
Fort McPherson	843	761	665	562
Fort Stewart	830	748	653	515
Hunter MF	799	717	622	483
Albany MCLB	953	871	776	649
Moody AFB	958	876	781	643
Marietta NAS	844	763	666	563
Kings Bay NSB	899	817	722	583
Robins AFB	878	796	700	578
IDAHO				
Gowen Field	2,452	2,412	2,344	2,483
Mtn Home AFB	2,423	2,381	2,314	2,452
ILLINOIS				
Army Area SUPCOM	794	761	693	854
Joliet MP	810	767	699	860
Great Lakes NTC	826	793	725	886
Rock Island Ars	940	896	829	989
St. Louis ASC	794	761	693	854
Savanna Depot	932	896	829	989
Scott AFB	926	871	795	885
INDIANA				
Camp Attebury	709	653	577	691
Crane Ammo Actv	786	730	653	731
Fort B. Harrison	692	636	560	695
Crane NWC	785	729	651	732
Newport MP	762	706	630	765
IOWA				
Camp Dodge	1,113	1,070	1,002	1,163
Iowa AAP	983	937	866	1,001
KANSAS				
Fort Leavenworth	1,198	1,142	1,066	1,183
Fort Riley	1,320	1,264	1,188	1,294
Kansas MP	1,266	1,210	1,134	1,220
McConnell AFB	1,369	1,313	1,237	1,337
Sunflower MP	1,207	1,151	1,075	1,181

TABLE C-1 - cont

	Bayonne, NJ	Philadelphia, PA	Baltimore, MD	Norfolk, VA
KENTUCKY				
Fort Campbell	899	835	743	730
Fort Knox	758	702	620	669
Lexington Depot	666	603	511	561
LOUISIANA				
Barksdale AFB	1,398	1,316	1,220	1,151
Camp Beauregard	1,355	1,273	1,177	1,109
Fort Polk	1,421	1,339	1,243	1,174
Louisiana MP	1,374	1,292	1,195	1,127
MAINE				
Camp Keyes	369	449	544	696
Brunswick NAS	344	424	519	671
MARYLAND				
Aberdeen PG	151	69	33	246
Andrews AFB	220	138	42	181
Edgewood Ars	161	79	25	238
Fort Richie	221	149	74	257
Fort Detrick	224	144	48	232
Fort Meade	196	114	18	203
Bethesda NMC	219	137	41	194
Pax River NAS	263	181	91	179
MASSACHUSETTS				
Fort Devens	209	289	384	536
Hanscom AFB	212	292	387	539
S Weymouth NAS	225	305	400	552
Otis AFB	243	323	418	570
Westover AFB	150	230	324	477
MICHIGAN				
Tank-Auto Cmd	624	595	527	691
Camp Grayling	796	767	699	863
Detroit Arsenal	617	588	521	685
Selfridge ANGB	637	608	541	704

TABLE C-1 - cont

	Bayonne, NJ	Philadelphia, PA	Baltimore, MD	Norfolk, VA
MINNESOTA				
Camp Ripley	1,286	1,256	1,189	1,350
Fort Snelling	1,185	1,155	1,088	1,249
Twin Cities MP	1,182	1,151	1,083	1,244
MISSISSIPPI				
Camp Shelby	1,188	1,106	1,010	941
Columbus AFB	1,054	972	876	821
Keesler AFB	1,228	1,146	1,050	947
Meridian NAS	1,099	1,017	921	852
Gulfport NCBC	1,238	1,156	1,060	956
MISSOURI				
Camp Clark	1,200	1,144	1,068	1,177
Fort Leonard Wood	1,068	1,012	936	1,036
Gateway MP	941	885	809	909
Lake City MP	1,163	1,107	1,032	1,137
Whiteman AFB	1,138	1,082	1,006	1,111
MONTANA				
Malmstrom AFB	2,155	2,125	2,058	2,219
NEBRASKA				
Offutt AFB	1,239	1,195	1,128	1,268
Sioux Army Depot	1,625	1,581	1,514	1,652
NEVADA				
Hawthorne MP	2,671	2,628	2,560	2,696
Nellis AFB	2,481	2,425	2,349	2,476
NEW JERSEY				
Belle Meade GD	39	52	147	306
Fort Dix	63	37	132	280
Fort Monmouth	41	73	167	298
Camp Kilmer	27	60	155	312
McGuire AFB	63	37	132	280
NWS, Earle	39	67	162	295

TABLE C-1 - cont

	Bayonne, NJ	Philadelphia, PA	Baltimore, MD	Norfolk, VA
NEW MEXICO				
Cannon AFB	1,801	1,745	1,669	1,719
Holloman AFB	2,021	1,965	1,889	1,918
Kirtland AFB	1,961	1,905	1,829	1,895
White Sands MR	2,091	2,035	1,959	1,989
NEW YORK				
Army Pictorial Ctr	16	98	192	344
Fort Drum	302	335	403	583
Fort Hamilton	14	87	182	331
Fort Wadsworth	10	83	178	328
Griffiss AFB	244	277	347	527
Hancock Field	247	259	327	506
Seneca Depot	247	259	288	504
Stewart AFB	43	122	217	369
Watervliet Arsenal	157	231	324	479
NORTH CAROLINA				
Fort Bragg	543	461	365	242
New River MCAS	524	455	368	195
Cherry Pt MCAS	503	433	364	174
Camp Lejeune	522	452	368	193
Pope AFB	529	447	352	226
S. Johnson AFB	491	409	314	165
NORTH DAKOTA				
Camp Grafton	1,568	1,538	1,471	1,635
Grand Forks AFB	1,495	1,466	1,398	1,562
Minot AFB	1,695	1,665	1,598	1,759

TABLE C-1 - cont

	Bayonne, NJ	Philadelphia, PA	Baltimore, MD	Norfolk, VA
OHIO				
Camp Perry	525	496	428	592
Def Const Spt Ctr	519	463	388	532
Def Elect Spt Ctr	591	535	459	585
Lima Tank Ctr	586	540	473	625
Ravenna MP	404	375	308	477
W-Patterson AFB	583	527	451	589
OKLAHOMA				
Altus AFB	1,569	1,514	1,438	1,476
Fort Sill	1,514	1,458	1,382	1,421
McAlester MP	1,399	1,343	1,267	1,258
Tinker AFB	1,436	1,380	1,304	1,334
Vance AFB	1,444	1,388	1,312	1,393
OREGON				
Kingsley Field	2,816	2,772	2,705	2,843
Roberts Field	2,774	2,734	2,666	2,805
Umatilla AD Actv	2,687	2,657	2,590	2,732
PENNSYLVANIA				
Carlisle Barracks	179	123	77	289
Frankford Arsenal	75	11	106	268
Hayes MP	351	292	224	392
Letterkenny Depot	209	152	88	280
Phila NavSupAct	85	4	95	257
New Cumberland Dpt	167	108	73	289
M'burg Def Dpt	168	112	78	293
Scranton MP	114	123	189	368
Tobyhanna Depot	94	102	181	351
RHODE ISLAND				
Quonset Pt NAS	176	256	350	502
SOUTH CAROLINA				
Charleston AFB	721	639	544	405
Charleston NB	723	641	546	407
Fort Jackson	668	586	491	364
Beaufort MCAS	765	683	588	449
Parris Island	772	690	595	456
Charleston NSC	723	641	546	407
Shaw AFB	663	581	486	347

TABLE C-1 - cont

	Bayonne, NJ	Philadelphia, PA	Baltimore, MD	Norfolk, VA
SOUTH DAKOTA				
Camp Rapid	1,671	1,637	1,569	1,730
Ellsworth AFB	1,667	1,632	1,565	1,725
TENNESSEE				
Defense Depot	1,084	1,002	906	884
Holston MP	606	524	428	408
Milan MP	991	917	821	800
Memphis NAS	1,066	986	890	869
Volunteer MP	792	710	614	578
TEXAS				
Bergstrom AFB	1,710	1,628	1,532	1,470
Brooks AFB	1,789	1,707	1,611	1,546
Camp Stanley	1,777	1,695	1,598	1,530
Corpus Christi Depot	1,818	1,736	1,640	1,571
Dyess AFB	1,720	1,647	1,550	1,529
Ellington AFB	1,602	1,520	1,423	1,355
Fort Bliss	2,102	2,046	1,970	1,966
Fort Hood	1,671	1,589	1,492	1,442
Fort S. Houston	1,781	1,699	1,603	1,539
Fort Walters	1,614	1,532	1,436	1,414
Goodfellow AFB	1,806	1,724	1,627	1,597
Kelly AFB	1,792	1,710	1,613	1,549
Lackland AFB	1,794	1,712	1,616	1,552
Laughlin AFB	1,945	1,864	1,767	1,704
Lone Star MP	1,372	1,290	1,194	1,173
Longhorn MP	1,433	1,351	1,254	1,189
Corpus Christi NAS	1,818	1,736	1,640	1,571
Kingsville NAS	1,829	1,747	1,651	1,583
Randolph AFB	1,772	1,690	1,594	1,529
Red River AD	1,378	1,296	1,200	1,179
Sheppard AFB	1,568	1,512	1,436	1,437
Reese AFB	1,786	1,730	1,654	1,655
UTAH				
Hill AFB	2,146	2,103	2,035	2,173
Tooele Depot	2,197	2,154	2,086	2,225

TABLE C-1 - cont

	Bayonne, NJ	Philadelphia, PA	Baltimore, MD	Norfolk, VA
VIRGINIA				
Cameron Station	228	147	50	184
Arlington Hall	224	142	45	189
Cheatham Annex	362	285	192	42
DGSC Richmond	330	248	153	90
Fort A. P. Hill	276	194	100	123
Fort Eustis	354	284	192	33
Fort Lee	346	264	169	75
Fort Myer	223	141	44	189
Fort Monroe	336	267	205	16
Fort Picket	374	292	197	113
Fort Story	327	257	227	18
Langley AFB	340	270	203	19
MCCDC Quantico	254	172	76	169
Norfolk NAS	328	259	213	6
Oceana NAS	331	261	230	14
Litle Creek NAB	322	253	217	9
Yorktown NWS	357	287	195	36
Radford MP	474	393	296	281
WASHINGTON				
Camp Murray	2,814	2,785	2,717	2,878
Fort Lawton	2,794	2,764	2,697	2,858
Fort Lewis	2,814	2,785	2,717	2,878
Fairchild AFB	2,524	2,495	2,428	2,589
McChord AFB	2,809	2,780	2,713	2,874
Bremerton NSC	2,810	2,780	2,713	2,874
Yakima Center	2,707	2,678	2,611	2,772
WISCONSIN				
Badger MP	963	930	863	1,023
Fort McCoy	1,026	993	926	1,086
Gen Mitchell Fld	868	835	767	928
WYOMING				
Camp Guernsey	1,739	1,695	1,628	1,767
F. E. Warren AFB	1,724	1,681	1,613	1,751

TABLE C-2
SURFACE (LAND) MILEAGE BETWEEN CONUS
MILITARY ACTIVITIES AND MAJOR NORTH ATLANTIC PORTS

	Wilmington, NC	Sunny Point, NC	Charleston, SC	Savannah, GA	Jacksonville, FLA
ALABAMA					
Anniston Depot	506	501	386	339	399
Fort McClellan	501	497	381	335	395
Fort Rucker	573	569	416	315	286
Maxwell AFB	561	557	424	327	354
Redstone Arsenal	592	587	475	432	496
ARIZONA					
Davis-Monthan AFB	2,110	2,106	1,984	1,887	1,914
Fort Huachuca	2,098	2,094	1,972	1,875	1,901
Luke AFB	2,221	2,217	2,095	1,998	2,024
Yuma MCAS	2,346	2,342	2,220	2,123	2,150
ARKANSAS					
Camp Robinson	922	918	803	759	799
Fort Chaffee	1,061	1,056	941	898	937
Little Rock AFB	918	914	799	756	795
Pine Bluff Arsenal	942	938	822	767	793
CALIFORNIA					
Alameda Nav Fac	2,888	2,884	2,768	2,709	2,735
Beale AFB	2,859	2,869	2,793	2,747	2,773
Camp Roberts	2,728	2,724	2,608	2,549	2,575
Castle AFB	2,784	2,779	2,664	2,604	2,631
Fort H. Liggett	2,757	2,753	2,637	2,578	2,604
Fort Irwin	2,500	2,496	2,380	2,321	2,347
Fort Ord	2,828	2,824	2,708	2,649	2,675
Letterman AMC	2,898	2,894	2,779	2,719	2,746
McClellan AFB	2,854	2,864	2,783	2,723	2,750
El Toro MCAS	2,559	2,555	2,433	2,336	2,363
MCAGCC 29 Palms	2,457	2,452	2,337	2,252	2,278
Camp Pendleton	2,554	2,550	2,428	2,331	2,358
Barstow MCLB	2,477	2,473	2,358	2,298	2,325
San Diego MCRD	2,524	2,520	2,398	2,301	2,327
Lemoore NAS	2,704	2,700	2,585	2,525	2,552
Los Alamitos NAS	2,566	2,562	2,440	2,343	2,369
Miramar NAS	2,523	2,519	2,397	2,300	2,326
Moffett Fld NAS	2,867	2,863	2,747	2,688	2,714
Long Beach NSC	2,574	2,570	2,448	2,351	2,377
San Diego NSC	2,524	2,519	2,398	2,300	2,327
Concord NWS	2,889	2,884	2,769	2,709	2,736
March AFB	2,557	2,567	2,418	2,321	2,347

TABLE C-2 - cont

	Wilmington, NC	Sunny Point, NC	Charleston, SC	Savannah, GA	Jacksonville, FLA
CALIFORNIA (cont)					
Seal Beach NWS	2,564	2,560	2,438	2,341	2,367
Oakland Base	2,889	2,885	2,769	2,710	2,736
Presidio of Mont	2,832	2,827	2,712	2,652	2,679
Presidio of SF	2,898	2,894	2,779	2,719	2,746
Riverbank AAP	2,832	2,828	2,712	2,653	2,679
Sacramento Depot	2,866	2,877	2,774	2,715	2,741
Sharpe Depot	2,843	2,838	2,723	2,664	2,690
Sierra Depot	2,781	2,791	2,715	2,670	2,696
Tracy Def Depot	2,834	2,830	2,715	2,655	2,682
Travis AFB	2,903	2,903	2,787	2,728	2,754
COLORADO					
Camp West	1,753	1,762	1,686	1,646	1,702
Fitzsimons AMC	1,738	1,747	1,670	1,631	1,686
Fort Carson	1,721	1,729	1,653	1,614	1,660
Peterson AFB	1,712	1,720	1,644	1,605	1,657
Pueblo Depot	1,697	1,706	1,615	1,572	1,611
Rocky Mtn Arsenal	1,737	1,746	1,669	1,630	1,685
WASH DC					
Bolling AFB	359	384	503	577	709
Fort McNair	360	385	504	578	709
Walter Reed AMC	365	389	508	583	714
FLORIDA					
Camp Blanding	438	429	275	170	34
Eglin AFB	660	650	496	391	315
Homestead AFB	768	759	605	500	364
MacDill AFB	597	588	434	329	197
Jacksonville NAS	414	404	251	146	10
Pensacola NAS	709	700	546	441	370
Key West NAS	906	897	743	638	501
Mayport NavSta	415	405	252	146	16
Patrick AFB	573	563	409	304	168
Tyndall AFB	619	609	456	350	275
Whiting Fld NAS	689	680	526	421	351
GEORGIA					
Dobbins AFB	422	418	304	261	327
Fort Benning	486	482	346	248	275

TABLE C-2 - cont

	Wilmington, NC	Sunny Point, NC	Charleston, SC	Savannah, GA	Jacksonville, FLA
GEORGIA - cont					
Fort Gillem	411	407	291	236	301
Fort Gordon	276	272	151	123	237
Fort McPherson	414	410	294	245	310
Fort Stewart	309	300	146	41	121
Hunter MF	278	268	115	7	136
Albany MCLB	474	464	311	210	190
Moody AFB	438	428	275	170	133
Marietta NAS	425	421	307	264	330
Kings Bay NSB	378	368	215	110	42
Robins AFB	403	398	257	160	214
IDAHO					
Gowen Field	2,509	2,519	2,443	2,403	2,469
Mtn Home AFB	2,478	2,489	2,412	2,373	2,439
ILLINOIS					
Army Area SUPCOM	902	913	887	914	1,001
Joliet MP	889	901	875	902	970
Great Lakes NTC	933	945	919	946	1,033
Rock Island Ars	1,020	1,031	1,002	989	1,055
St. Louis ASC	902	913	887	914	1,001
Savanna Depot	1,037	1,048	1,023	1,027	1,092
Scott AFB	875	883	809	769	835
INDIANA					
Camp Attebury	717	729	671	698	785
Crane Ammo Actv	734	743	680	701	767
Fort B. Harrison	721	733	708	735	874
Crane NWC	736	745	682	703	769
Newport MP	791	803	760	774	840
IOWA					
Camp Dodge	1,191	1,203	1,167	1,132	1,197
Iowa AAP	1,027	1,039	1,006	977	1,042
KANSAS					
Fort Leavenworth	1,173	1,182	1,106	1,066	1,132
Fort Riley	1,284	1,293	1,217	1,177	1,238
Kansas MP	1,148	1,157	1,066	1,033	1,062
McConnell AFB	1,282	1,291	1,200	1,157	1,196
Sunflower MP	1,171	1,179	1,103	1,064	1,117

TABLE C-2 cont

	Wilmington, NC	Sunny Point, NC	Charleston, SC	Savannah, GA	Jacksonville, FLA
KENTUCKY					
Fort Campbell	659	668	589	549	615
Fort Knox	649	658	595	612	678
Lexington Depot	568	580	530	557	678
LOUISIANA					
Barksdale AFB	1,004	999	878	780	807
Camp Beauregard	961	957	835	738	721
Fort Polk	1,027	1,023	901	803	756
Louisiana MP	979	975	853	756	783
MAINE					
Camp Keyes	941	965	1,085	1,159	1,290
Brunswick NAS	916	939	1,059	1,134	1,265
MARYLAND					
Aberdeen PG	430	454	573	648	779
Andrews AFB	365	389	508	582	714
Edgewood Ars	422	446	565	640	771
Fort Richie	427	451	571	639	770
Fort Detrick	402	426	546	620	751
Fort Meade	383	408	527	601	732
Bethesda NMC	366	391	510	584	716
Pax River NAS	362	387	506	580	712
MASSACHUSETTS					
Fort Devens	781	804	924	998	1,130
Hanscom AFB	784	807	927	1,002	1,133
S Weymouth NAS	797	820	940	1,015	1,146
Otis AFB	815	838	958	1,032	1,164
Westover AFB	722	745	865	940	1,071
MICHIGAN					
Tank-Auto Cmd	786	797	831	863	994
Camp Grayling	957	969	1,002	1,035	1,162
Detroit Arsenal	779	791	824	857	988
Selfridge ANGB	799	810	844	876	1,008

TABLE C-2 - cont

	Wilmington, NC	Sunny Point, NC	Charleston, SC	Savannah, GA	Jacksonville, FLA
MINNESOTA					
Camp Ripley	1,398	1,409	1,383	1,410	1,489
Fort Snelling	1,291	1,303	1,277	1,304	1,377
Twin Cities MP	1,297	1,309	1,283	1,310	1,389
MISSISSIPPI					
Camp Shelby	794	790	658	561	499
Columbus AFB	674	670	554	491	518
Keesler AFB	785	781	648	543	473
Meridian NAS	705	701	579	482	508
Gulfport NCBC	795	791	658	552	483
MISSOURI					
Camp Clark	1,124	1,133	1,043	1,000	1,039
Fort Leonard Wood	983	992	913	874	939
Gateway MP	899	908	832	793	858
Lake City MP	1,127	1,136	1,060	1,020	1,086
Whiteman AFB	1,087	1,096	1,017	977	1,043
MONTANA					
Malmstrom AFB	2,266	2,278	2,252	2,242	2,307
NEBRASKA					
Offutt AFB	1,294	1,306	1,247	1,208	1,274
Sioux Army Depot	1,678	1,688	1,612	1,573	1,638
NEVADA					
Hawthorne MP	2,688	2,683	2,568	2,508	2,535
Nellis AFB	2,377	2,373	2,257	2,198	2,224
NEW JERSEY					
Belle Meade GD	544	568	687	762	893
Fort Dix	525	549	673	747	878
Fort Monmouth	543	566	701	776	908
Camp Kilmer	552	576	695	769	901
McGuire AFB	525	549	673	747	878
NWS, Earle	541	564	699	774	905

TABLE C-2 - cont

	Wilmington, NC	Sunny Point, NC	Charleston, SC	Savannah, GA	Jacksonvuille, FLA
NEW MEXICO					
Cannon AFB	1,613	1,608	1,493	1,403	1,429
Holloman AFB	1,771	1,767	1,645	1,548	1,574
Kirtland AFB	1,796	1,791	1,676	1,617	1,643
White Sands MR	1,841	1,837	1,715	1,618	1,645
NEW YORK					
Army Pictorial Ctr	589	613	733	807	938
Fort Drum	797	821	941	1,014	1,145
Fort Hamilton	577	600	722	797	928
Fort Wadsworth	573	596	719	793	924
Griffiss AFB	745	770	889	963	1,094
Hancock Field	720	745	864	937	1,069
Seneca Depot	682	706	825	899	1,030
Stewart AFB	614	637	757	832	963
Watervliet Arsenal	722	747	866	940	1,072
NORTH CAROLINA					
Fort Bragg	136	145	215	277	409
New River MCAS	50	74	216	324	455
Cherry Pt MCAS	101	124	266	374	505
Camp Lejeune	53	76	218	326	457
Pope AFB	108	120	201	276	407
S. Johnson AFB	93	118	243	327	458
NORTH DAKOTA					
Camp Grafton	1,692	1,703	1,677	1,704	1,780
Grand Forks AFB	1,619	1,631	1,605	1,632	1,708
Minot AFB	1,807	1,818	1,792	1,819	1,895
OHIO					
Camp Perry	709	721	754	787	918
Def Const Spt Ctr	590	602	635	668	799
Def Elect Spt Ctr	611	623	656	684	805
Lima Tank Ctr	676	687	721	753	879
Ravenna MP	640	665	704	737	868
Rickenbacker Bur	580	591	625	657	789
W-Patterson AFB	616	628	661	693	814

TABLE C-2 - cont

	Wilmington, NC	Sunny Point, NC	Charleston, SC	Savannah, GA	Jacksonville, FLA
OKLAHOMA					
Altus AFB	1,377	1,373	1,257	1,193	1,220
Fort Sill	1,322	1,318	1,202	1,158	1,184
McAlester MP	1,158	1,154	1,039	996	1,035
Tinker AFB	1,235	1,231	1,116	1,072	1,112
Vance AFB	1,300	1,296	1,180	1,137	1,176
OREGON					
Kingsley Field	2,870	2,880	2,804	2,764	2,830
Roberts Field	2,831	2,841	2,765	2,725	2,791
Umatilla AD Actv	2,758	2,768	2,692	2,653	2,718
PENNSYLVANIA					
Carlisle Barracks	462	486	605	679	810
Frankford Arsenal	503	527	646	720	852
Hayes MP	559	584	634	667	798
Letterkenny Depot	450	474	590	652	784
Willow Grove NAS	513	537	656	731	862
Phila NavSupAct	492	517	636	710	841
New Cumberland Dpt	469	494	613	687	819
M'burg Def Dpt	468	493	612	686	817
Scranton MP	586	611	730	804	936
Tobyhanna Depot	580	604	723	798	929
RHODE ISLAND					
Quonset Pt NAS	747	771	891	965	1,097
SOUTH CAROLINA					
Charleston AFB	168	158	9	110	241
Charleston Depot	173	163	14	112	243
Charleston NB	169	159	6	109	240
Fort Jackson	189	193	119	152	283
Beaufort MCAS	230	221	67	45	181
Parris Island	237	228	74	43	180
Charleston NSC	169	159	6	109	240
Shaw AFB	164	158	104	154	285
SOUTH DAKOTA					
Camp Rapid	1,767	1,778	1,742	1,707	1,773
Ellsworth AFB	1,767	1,779	1,743	1,707	1,773

TABLE C-2 - cont

	Wilmington, NC	Sunny Point, NC	Charleston, SC	Savannah, GA	Jacksonville, FLA
TENNESSEE					
Defense Depot	779	775	660	616	654
Holston MP	368	376	354	381	506
Milan MP	728	737	650	607	666
Memphis NAS	797	799	683	640	681
Volunteer MP	491	495	401	361	427
TEXAS					
Bergstrom AFB	1,323	1,319	1,197	1,098	1,028
Brooks AFB	1,392	1,387	1,254	1,149	1,080
Camp Stanley	1,376	1,372	1,239	1,134	1,064
Corpus Christi Depot	1,417	1,413	1,280	1,175	1,105
Dyess AFB	1,381	1,377	1,255	1,158	1,184
Ellington AFB	1,200	1,196	1,063	958	889
Fort Bliss	1,818	1,814	1,692	1,595	1,616
Fort Hood	1,294	1,290	1,168	1,071	1,065
Fort S. Houston	1,387	1,383	1,250	1,145	1,075
Fort Walters	1,267	1,262	1,141	1,043	1,070
Goodfellow AFB	1,450	1,445	1,324	1,226	1,235
Kelly AFB	1,396	1,392	1,259	1,154	1,084
Lackland AFB	1,399	1,395	1,262	1,157	1,087
Laughlin AFB	1,552	1,548	1,415	1,309	1,240
Lone Star MP	1,045	1,040	925	850	876
Longhorn MP	1,042	1,038	916	819	845
Corpus Christi NAS	1,417	1,413	1,280	1,175	1,105
Kingsville NAS	1,428	1,424	1,291	1,186	1,116
Randolph AFB	1,375	1,371	1,238	1,132	1,063
Red River AD	1,051	1,047	932	856	883
Sheppard AFB	1,310	1,306	1,190	1,108	1,134
Reese AFB	1,528	1,524	1,406	1,309	1,335
UTAH					
Hill AFB	2,200	2,210	2,134	2,094	2,160
Tooele Depot	2,251	2,261	2,185	2,145	2,211

TABLE C-2 - cont

	Wilmington, NC	Sunny Point, NC	Charleston, SC	Savannah, GA	Jacksonville, FLA
VIRGINIA					
Cameron Station	352	376	495	570	701
Arlington Hall	357	381	500	574	706
Cheatham Annex	274	297	425	499	631
DGSC Richmond	247	272	391	465	596
Fort A.P. Hill	306	331	450	524	656
Fort Eustis	264	288	422	497	628
Fort Lee	230	255	374	448	580
Fort Myer	357	381	501	575	706
Fort Monroe	258	282	417	492	623
Fort Picket	229	253	362	436	568
Fort Story	263	286	421	496	628
Langley AFB	258	281	416	491	622
MCCDC Quantico	337	361	480	555	686
Norfolk NAS	251	274	409	484	616
Oceana NAS	260	283	418	493	624
Litle Creek NAB	254	277	412	487	619
Yorktown NWS	268	291	426	501	632
Radford MP	307	323	356	389	520
WASHINGTON					
Camp Murray	2,924	2,936	2,899	2,864	2,930
Fort Lawton	2,904	2,915	2,879	2,844	2,910
Fort Lewis	2,924	2,936	2,899	2,864	2,930
Fairchild AFB	2,635	2,646	2,610	2,575	2,640
McChord AFB	2,919	2,931	2,895	2,860	2,925
Bremerton NSC	2,920	2,931	2,895	2,860	2,926
Yakima Center	2,817	2,829	2,793	2,755	2,820
WISCONSIN					
Badger MP	1,071	1,083	1,057	1,084	1,161
Fort McCoy	1,134	1,146	1,120	1,147	1,227
Gen Mitchell Fld	975	987	961	988	1,075
WYOMING					
Camp Guernsey	1,793	1,803	1,727	1,688	1,753
F. E. Warren AFB	1,778	1,788	1,712	1,672	1,738

TABLE C-3
SURFACE (LAND) MILEAGE BETWEEN CONUS
MILITARY ACTIVITIES AND MAJOR NORTH ATLANTIC PORTS

	San Diego, CA	Long Beach, CA	Oakland, CA	Portland, OR	Tacoma, WA
ALABAMA					
Anniston Depot	2,021	2,072	2,395	2,538	2,563
Fort McClellan	2,032	2,083	2,395	2,538	2,395
Fort Rucker	2,049	2,100	2,458	2,658	2,683
Maxwell AFB	1,973	2,024	2,382	2,570	2,595
Redstone Arsenal	1,984	2,014	2,311	2,441	2,461
ARIZONA					
Davis-Monthan AFB	414	494	858	1,363	1,505
Fort Huachuca	485	565	929	1,434	1,576
Luke AFB	345	366	731	1,230	1,371
Yuma MCAS	177	276	646	1,217	1,363
ARKANSAS					
Camp Robinson	1,650	1,680	1,978	2,180	2,205
Fort Chaffee	1,505	1,535	1,833	2,036	2,090
Little Rock AFB	1,652	1,682	1,980	2,181	2,207
Pine Bluff Arsenal	1,661	1,710	2,008	2,211	2,236
CALIFORNIA					
Beale AFB	542	444	113	551	697
Camp Roberts	335	238	189	822	968
Castle AFB	402	304	114	696	842
Fort H. Liggett	364	267	165	799	945
Fort Irwin	211	162	439	986	1,132
Fort Ord	435	337	106	740	886
Letterman AMC	506	408	12	646	792
McClellan AFB	513	417	91	591	737
El Toro MCAS	80	32	415	1,011	1,157
MCAGCC 29 Palms	169	153	508	1,055	1,201
Camp Pendleton	50	71	459	1,056	1,202
Barstow MCLB	181	132	412	959	1,105
San Diego MCRD	4	103	491	1,088	1,234
Lemoore NAS	317	219	202	793	939
Los Alamitos NAS	101	10	397	993	1,139
Miramar NAS	11	104	493	1,089	1,235
Moffett Fld NAS	474	377	41	676	822
San Diego NSC	4	110	499	1,095	1,241
Concord NWS	496	398	27	625	771
March AFB	86	77	429	996	1,142

TABLE C-3 - cont

	San Diego, CA	Long Beach, CA	Oakland, CA	Portland, OR	Tacoma, WA
CALIFORNIA (cont)					
Seal Beach NWS	99	11	399	996	1,142
Oakland Base	110	72	428	998	1,144
Presidio of Mont	496	399	1	636	782
Presidio of SF	506	408	12	646	792
Riverbank AAP	445	347	90	666	812
Sacramento Depot	507	409	86	592	738
Sharpe Depot	1,019	355	68	641	787
Sierra Depot	614	545	263	487	633
Tracy Def Depot	442	344	58	654	800
Travis AFB	518	421	57	599	745
COLORADO					
Camp West	1,079	1,030	1,202	1,239	1,294
Fitzsimons AMC	1,096	1,047	1,219	1,244	1,298
Fort Carson	1,083	1,086	1,258	1,312	1,366
Peterson AFB	1,092	1,088	1,260	1,310	1,364
Pueblo Depot	1,067	1,081	1,266	1,346	1,400
Rocky Mtn Arsenal	1,096	1,047	1,219	1,243	1,297
WASH DC					
Bolling AFB	2,594	2,624	2,781	2,758	2,707
Fort McNair	2,591	2,621	2,778	2,755	2,704
Walter Reed AMC	2,586	2,616	2,773	2,750	2,699
FLORIDA					
Camp Blanding	2,314	2,366	2,724	2,904	2,929
Eglin AFB	2,026	2,077	2,435	2,693	2,721
Homestead AFB	2,645	2,697	3,055	3,243	3,268
MacDill AFB	2,406	2,457	2,815	3,020	3,045
Jacksonville NAS	2,330	2,382	2,740	2,904	2,924
Pensacola NAS	1,981	2,032	2,390	2,648	2,692
Key West NAS	2,779	2,830	3,189	3,377	3,402
Mayport NavSta	2,342	2,393	2,751	2,913	2,933
Patrick AFB	2,472	2,524	2,882	3,063	3,085
Tyndall AFB	2,093	2,144	2,502	2,760	2,787
Whiting Fld NAS	1,996	2,047	2,405	2,658	2,683
GEORGIA					
Dobbins AFB	2,118	2,169	2,469	2,571	2,591
Fort Benning	2,065	2,116	2,474	2,637	2,662

TABLE C-3 - cont

	San Diego, CA	Long Beach, CA	Oakland, CA	Portland, OR	Tacoma, WA
GEORGIA - cont					
Fort Gillem	2,124	2,175	2,490	2,597	2,617
Fort Gordon	2,264	2,315	2,629	2,732	2,752
Fort McPherson	2,114	2,166	2,481	2,588	2,608
Fort Stewart	2,289	2,341	2,699	2,821	2,841
Hunter MF	2,304	2,355	2,713	2,836	2,856
Albany MCLB	2,139	2,190	2,548	2,720	2,745
Moody AFB	2,217	2,267	2,626	2,798	2,823
Marietta NAS	2,115	2,166	2,467	2,569	2,589
Kings Bay NSB	2,314	2,365	2,723	2,884	2,904
Robins AFB	2,145	2,196	2,555	2,684	2,704
IDAHO					
Gowen Field	942	873	638	428	482
Mtn Home AFB	917	848	654	482	536
ILLINOIS					
Army Area SUPCOM	2,032	2,020	2,110	2,067	2,015
Joliet MP	1,988	2,007	2,098	2,092	2,040
Great Lakes NTC	2,062	2,047	2,137	2,041	1,990
Rock Island Ars	1,880	1,865	1,956	1,946	1,895
St. Louis ASC	2,032	2,020	2,110	2,067	2,016
Savanna Depot	1,945	1,919	2,009	1,947	1,896
Scott AFB	1,813	1,843	2,074	2,067	2,087
INDIANA					
Camp Attebury	2,049	2,079	2,259	2,253	2,228
Crane Ammo Actv	1,992	2,022	2,252	2,246	2,227
Fort B. Harrison	2,039	2,069	2,233	2,227	2,201
Crane NWC	1,994	2,024	2,250	2,244	2,225
Newport MP	1,967	1,997	2,167	2,160	2,138
IOWA					
Camp Dodge	1,733	1,697	1,788	1,771	1,720
Iowa AAP	1,823	1,833	1,924	1,918	1,884
KANSAS					
Fort Leavenworth	1,549	1,579	1,786	1,780	1,811
Fort Riley	1,442	1,472	1,691	1,688	1,742
Kansas MP	1,490	1,520	1,815	1,872	1,927
McConnell AFB	1,359	1,389	1,684	1,741	1,795
Sunflower MP	1,531	1,562	1,792	1,792	1,842

TABLE C-3 - cont

	San Diego, CA	Long Beach, CA	Oakland, CA	Portland, OR	Tacoma, WA
KENTUCKY					
Fort Campbell	1,963	1,993	2,291	2,285	2,305
Fort Knox	2,063	2,093	2,324	2,318	2,321
Lexington Depot	2,137	2,167	2,398	2,392	2,381
LOUISIANA					
Barksdale AFB	1,522	1,573	1,931	2,189	2,244
Camp Beauregard	1,638	1,689	2,047	2,305	2,360
Fort Polk	1,619	1,670	2,029	2,289	2,343
Louisiana MP	1,543	1,595	1,953	2,211	2,265
MAINE					
Camp Keyes	3,079	3,103	3,193	3,156	3,105
Brunswick NAS	3,055	3,078	3,169	3,132	3,080
MARYLAND					
Aberdeen PG	2,625	2,655	2,802	2,780	2,728
Andrews AFB	2,601	2,631	2,788	2,765	2,714
Edgewood Ars	2,617	2,647	2,798	2,776	2,724
Fort Richie	2,534	2,564	2,710	2,687	2,636
Fort Detrick	2,549	2,579	2,735	2,713	2,661
Fort Meade	2,593	2,623	2,780	2,757	2,705
Bethesda NMC	2,581	2,611	2,768	2,745	2,694
Pax River NAS	2,651	2,681	2,838	2,815	2,764
MASSACHUSETTS					
Fort Devens	2,928	2,958	3,055	3,018	2,967
Hanscom AFB	2,932	2,961	3,066	3,029	2,977
S Weymouth NAS	2,946	2,976	3,094	3,057	3,005
Otis AFB	2,963	2,993	3,117	3,080	3,028
Westover AFB	2,863	2,893	2,995	2,958	2,906
MICHIGAN					
Tank-Auto Cmd	2,290	2,291	2,382	2,278	2,227
Camp Grayling	2,338	2,823	2,372	2,166	2,114
Detroit Arsenal	2,273	2,274	2,365	2,261	2,210
Selfridge ANGB	2,304	2,305	2,396	2,280	2,229

TABLE C-3 - cont

	San Diego, CA	Long Beach, CA	Oakland, CA	Portland, OR	Tacoma, WA
MINNESOTA					
Camp Ripley	1,918	1,869	1,908	1,591	1,539
Fort Snelling	1,902	1,853	1,902	1,674	1,623
Twin Cities MP	1,915	1,866	1,915	1,678	1,627
MISSISSIPPI					
Camp Shelby	1,834	1,885	2,243	2,501	2,555
Columbus AFB	1,877	1,928	2,247	2,409	2,435
Keesler AFB	1,872	1,923	2,288	2,552	2,607
Meridian NAS	1,841	1,892	2,250	2,478	2,503
Gulfport NCBC	1,862	1,914	2,279	2,543	2,597
MISSOURI					
Camp Clark	1,534	1,564	1,859	1,903	1,928
Fort Leonard Wood	1,675	1,705	2,000	2,002	2,027
Gateway MP	1,785	1,815	2,054	2,048	2,068
Lake City MP	1,563	1,593	1,822	1,816	1,841
Whiteman AFB	1,603	1,633	1,877	1,870	1,896
MONTANA					
Malmstrom AFB	1,319	1,270	1,157	710	658
NEBRASKA					
Offutt AFB	1,618	1,573	1,664	1,658	1,650
Sioux Army Depot	1,245	1,196	1,265	1,259	1,313
NEVADA					
Hawthorne MP	481	412	291	665	807
Nellis AFB	344	295	563	961	1,094
NEW JERSEY					
Belle Meade GD	2,704	2,734	2,870	2,834	2,782
Fort Dix	2,697	2,727	2,876	2,850	2,798
Fort Monmouth	2,729	2,759	2,903	2,866	2,814
Camp Kilmer	2,708	2,738	2,874	2,837	2,785
McGuire AFB	2,697	2,727	2,876	2,850	2,798
NWS, Earle	2,723	2,753	2,898	2,862	2,810

TABLE C-3 - cont

	San Diego,	Long Beach,	Oakland,	Portland,	Tacoma,
NEW MEXICO					
Cannon AFB	965	995	1,306	1,574	1,628
Holloman AFB	752	803	1,168	1,578	1,632
Kirtland AFB	765	795	1,092	1,368	1,422
White Sands MR	690	742	1,106	1,587	1,641
NEW YORK					
Army Pictorial Ctr	2,738	2,768	2,897	2,860	2,809
Fort Drum	2,736	2,759	2,850	2,813	2,761
Fort Hamilton	2,734	2,763	2,899	2,862	2,811
Fort Wadsworth	2,730	2,760	2,896	2,859	2,808
Griffiss AFB	2,710	2,733	2,823	2,786	2,735
Hancock Field	2,670	2,693	2,783	2,746	2,695
Seneca Depot	2,633	2,656	2,747	2,710	2,658
Stewart AFB	2,763	2,792	2,917	2,880	2,828
Watervliet Arsenal	2,806	2,829	2,919	2,882	2,831
NORTH CAROLINA					
Fort Bragg	2,471	2,522	2,829	2,832	2,807
New River MCAS	2,563	2,614	2,928	2,938	2,912
Cherry Pt MCAS	2,613	2,663	2,961	2,956	2,930
Camp Lejeune	2,563	2,614	2,928	2,938	2,912
Pope AFB	2,482	2,533	2,838	2,833	2,807
S. Johnson AFB	2,546	2,589	2,887	2,881	2,856
NORTH DAKOTA					
Camp Grafton	1,815	1,766	1,721	1,377	1,326
Grand Forks AFB	1,870	1,821	1,794	1,449	1,398
Minot AFB	1,729	1,680	1,614	1,266	1,214
OHIO					
Camp Perry	2,258	2,280	2,371	2,328	2,277
Def Const Spt Ctr	2,207	2,237	2,395	2,389	2,340
Def Elect Spt Ctr	2,144	2,174	2,332	2,326	2,300
Lima Tank Ctr	2,182	2,212	2,314	2,292	2,240
Ravenna MP	2,354	2,384	2,485	2,449	2,397
Rickenbacker Bur	2,210	2,240	2,399	2,392	2,345
W-Patterson AFB	2,146	2,176	2,334	2,328	2,303

TABLE C-3 - cont

	San Diego, CA	Long Beach, CA	Oakland, CA	Portland, OR	Tacoma, WA
OKLAHOMA					
Altus AFB	1,215	1,245	1,542	1,799	1,853
Fort Sill	1,270	1,300	1,598	1,854	1,908
McAlester MP	1,434	1,464	1,761	1,967	2,022
Tinker AFB	1,325	1,355	1,653	1,859	1,913
Vance AFB	1,317	1,347	1,645	1,794	1,848
OREGON					
Kingsley Field	812	718	361	290	436
Roberts Field	965	868	511	143	285
Umatilla AD Actv	1,131	1,062	712	179	239
PENNSYLVANIA					
Carlisle Barracks	2,553	2,583	2,732	2,710	2,658
Frankford Arsenal	2,672	2,701	2,848	2,825	2,773
Hayes MP	2,383	2,413	2,555	2,533	2,481
Letterkenny Depot	2,530	2,560	2,706	2,684	2,632
Willow Grove NAS	2,669	2,699	2,848	2,815	2,764
Phila Nav Sup Act	2,668	2,698	2,844	2,822	2,770
New Cumberland Dpt	2,566	2,596	2,745	2,723	2,671
M'burg Def Dpt	2,558	2,588	2,738	2,715	2,663
Scranton MP	2,648	2,678	2,799	2,762	2,710
Tobyhanna Depot	2,658	2,688	2,810	2,774	2,722
RHODE ISLAND					
Quonset Pt NAS	2,896	2,926	3,050	3,014	2,962
SOUTH CAROLINA					
Charleston AFB	2,394	2,445	2,759	2,862	2,878
Charleston Depot	2,389	2,441	2,755	2,857	2,873
Charleston NB	2,395	2,447	2,762	2,865	2,881
Fort Jackson	2,334	2,385	2,699	2,781	2,783
Beaufort MCAS	2,342	2,393	2,739	2,841	2,861
Parris Island	2,341	2,392	2,746	2,848	2,868
Charleston NSC	2,395	2,447	2,762	2,865	2,881
Shaw AFB	2,361	2,412	2,726	2,809	2,811
SOUTH DAKOTA					
Camp Rapid	1,366	1,317	1,366	1,196	1,145
Ellsworth AFB	1,368	1,319	1,369	1,200	1,149

TABLE C-3 - cont

	San Diego, CA	Long Beach, CA	Oakland, CA	Portland, OR	Tacoma WA
TENNESSEE					
Defense Depot	1,782	1,812	2,110	2,253	2,278
Holston MP	2,256	2,286	2,583	2,588	2,577
Milan MP	1,872	1,902	2,200	2,274	2,294
Memphis NAS	1,794	1,824	2,122	2,265	2,290
Volunteer MP	2,102	2,132	2,430	2,482	2,502
TEXAS					
Bergstrom AFB	1,316	1,367	1,732	2,070	2,124
Brooks AFB	1,290	1,341	1,706	2,083	2,138
Camp Stanley	1,297	1,348	1,713	2,090	2,145
Corpus Christi Depot	1,441	1,492	1,857	2,235	2,289
Dyess AFB	1,152	1,203	1,568	1,843	1,898
Ellington AFB	1,490	1,541	1,906	2,218	2,272
Fort Bliss	732	783	1,148	1,628	1,683
Fort Hood	1,303	1,354	1,719	2,024	2,079
Fort S. Houston	1,288	1,339	1,704	2,081	2,135
Fort Walters	1,256	1,307	1,672	1,943	1,997
Goodfellow AFB	1,133	1,184	1,549	1,872	1,926
Kelly AFB	1,291	1,342	1,707	2,084	2,139
Lackland AFB	1,289	1,341	1,705	2,083	2,137
Laughlin AFB	1,157	1,208	1,573	1,968	2,022
Lone Star MP	1,500	1,551	1,869	2,123	2,177
Longhorn MP	1,496	1,547	1,903	2,159	2,213
Corpus Christi NAS	1,441	1,492	1,857	2,235	2,289
Kingsville NAS	1,416	1,467	1,832	2,227	2,281
Randolph AFB	1,293	1,344	1,709	2,086	2,140
Red RiverAD	1,493	1,545	1,863	2,117	2,171
Sheppard AFB	1,245	1,297	1,606	1,862	1,916
Reese AFB	1,032	1,080	1,420	1,688	1,742
UTAH					
Hill AFB	776	727	756	742	796
Tooele Depot	737	688	715	804	858

TABLE C-3 - cont

	San Diego, CA	Long Beach, CA	Oakland, CA	Portland, OR	Tacoma, WA
VIRGINIA					
Cameron Station	2,588	2,618	2,776	2,761	2,710
Arlington Hall	2,585	2,615	2,774	2,756	2,705
Cheatham Annex	2,638	2,668	2,878	2,872	2,826
DGSC Richmond	2,586	2,616	2,828	2,822	2,782
Fort A.P. Hill	2,616	2,646	2,809	2,794	2,743
Fort Eustis	2,646	2,676	2,886	2,881	2,835
Fort Lee	2,590	2,620	2,843	2,837	2,798
Fort Myer	2,586	2,616	2,775	2,755	2,704
Fort Monroe	2,664	2,694	2,904	2,898	2,852
Fort Picket	2,557	2,587	2,815	2,809	2,784
Fort Story	2,677	2,707	2,926	2,920	2,874
Langley AFB	2,662	2,692	2,902	2,896	2,850
MCCDC Quantico	2,587	2,617	2,775	2,761	2,709
Norfolk NAS	2,665	2,695	2,913	2,906	2,861
Oceana NAS	2,674	2,704	2,929	2,923	2,877
Litle Creek NAB	2,668	2,698	2,916	2,910	2,864
Yorktown NWS	2,643	2,673	2,883	2,877	2,831
Radford MP	2,386	2,416	2,666	2,660	2,634
WASHINGTON					
Camp Murray	1,223	1,126	769	132	15
Fort Lawton	1,270	1,172	816	179	36
Fort Lewis	1,223	1,126	769	132	15
Fairchild AFB	1,300	1,232	880	343	289
McChord AFB	1,228	1,130	774	137	10
Bremerton NSC	1,260	1,163	806	169	29
Yakima Center	1,176	1,079	722	183	142
WISCONSIN					
Badger MP	2,017	1,989	2,058	1,898	1,848
Fort McCoy	1,998	1,948	1,998	1,842	1,790
WYOMING					
Camp Guernsey	1,200	1,151	1,201	1,173	1,213
F. E. Warren AFB	1,168	1,119	1,169	1,163	1,217

TABLE C-4
SURFACE (LAND) MILEAGE BETWEEN CONUS
MILITARY ACTIVITIES AND MAJOR NORTH ATLANTIC PORTS

	Mobile, AL	New Orleans, LA	Beaumont, TX	Houston, TX	Corpus Christi, TX
ALABAMA					
Anniston Depot	274	392	610	697	907
Fort McClellan	280	403	621	707	918
Fort Rucker	179	320	560	646	857
Maxwell AFB	167	309	549	635	846
Redstone Arsenal	327	432	632	718	929
ARIZONA					
Davis-Monthan AFB	1,509	1,397	1,136	1,059	1,015
Fort Huachuca	1,496	1,385	1,123	1,047	1,003
Luke AFB	1,619	1,508	1,246	1,170	1,126
Yuma MCAS	1,745	1,633	1,372	1,295	1,251
ARKANSAS					
Camp Robinson	451	433	398	441	651
Fort Chaffee	595	553	433	464	658
Little Rock AFB	464	445	412	454	665
Pine Bluff Arsenal	414	395	384	428	639
CALIFORNIA					
Alameda Nav Fac	2,330	2,226	1,964	1,888	1,844
Beale AFB	2,368	2,270	2,011	1,935	1,891
Camp Roberts	2,170	2,066	1,804	1,728	1,684
Castle AFB	2,226	2,128	1,871	1,795	1,751
Fort H. Liggett	2,200	2,095	1,833	1,757	1,713
Fort Irwin	1,942	1,844	1,618	1,542	1,499
Fort Ord	2,270	2,165	1,904	1,828	1,784
Letterman AMC	2,341	2,236	1,975	1,899	1,854
McClellan AFB	2,345	2,245	1,984	1,908	1,864
El Toro MCAS	1,958	1,846	1,585	1,508	1,464
MCAGCC 29 Palms	1,873	1,762	1,500	1,424	1,380
Camp Pendleton	1,953	1,841	1,580	1,503	1,459
Barstow MCLB	1,920	1,821	1,592	1,516	1,472
San Diego MCRD	1,922	1,811	1,550	1,473	1,429
Lemoore NAS	2,147	2,047	1,786	1,710	1,665
Los Alamitos NAS	1,964	1,853	1,591	1,515	1,471
Miramar NAS	1,921	1,810	1,548	1,472	1,428
Moffett Fld NAS	2,310	2,205	1,943	1,867	1,823
Long Beach NSC	1,972	1,861	1,599	1,523	1,479
San Diego NSC	1,922	1,810	1,549	1,473	1,429
Concord NWS	2,331	2,226	1,965	1,889	1,844
March AFB	1,936	1,837	1,568	1,481	1,439

TABLE C-4 - cont

	Mobile, AL	New Orleans, LA	Beaumont, TX	Houston, TX	Corpus Christi, TX
CALIFORNIA - cont					
Seal Beach NWS	1,962	1,851	1,589	1,513	1,469
Oakland Base	2,331	2,227	1,965	1,889	1,845
Presidio of Mont	2,274	2,169	1,908	1,832	1,787
Presidio of SF	2,341	2,236	1,975	1,899	1,854
Riverbank AAP	2,274	2,175	1,914	1,837	1,793
Sacramento Depot	2,336	2,237	1,976	1,899	1,855
Sharpe Depot	2,285	2,183	1,921	1,845	1,801
Sierra Depot	2,291	2,193	1,967	1,891	1,866
Tracy Def Depot	2,277	2,172	1,911	1,835	1,790
Travis AFB	2,349	2,249	1,987	1,911	1,867
COLORADO					
Camp West	1,367	1,278	1,072	1,035	1,088
Fitzsimons AMC	1,352	1,263	1,057	1,019	1,073
Fort Carson	1,310	1,217	1,004	966	1,013
Peterson AFB	1,315	1,225	1,012	975	1,021
Pueblo Depot	1,261	1,172	965	927	981
Rocky Mtn Arsenal	1,351	1,262	1,056	1,018	1,072
WASH DC					
Bolling AFB	953	1,074	1,293	1,379	1,590
Fort McNair	951	1,072	1,290	1,376	1,587
Walter Reed AMC	954	1,074	1,293	1,379	1,590
FLORIDA					
Camp Blanding	399	541	781	867	1,078
Eglin AFB	106	248	488	574	785
Homestead AFB	726	867	1,107	1,194	1,404
MacDill AFB	486	628	868	954	1,165
Jacksonville NAS	415	557	797	883	1,094
Pensacola NAS	61	203	443	529	740
Key West NAS	859	1,001	1,241	1,327	1,538
Mayport NavSta	428	569	809	896	1,106
Patrick AFB	553	694	934	1,021	1,231
Tyndall AFB	173	315	555	641	852
Whiting Fld NAS	76	218	458	544	755
GEORGIA					
Dobbins AFB	337	479	707	793	1,004
Fort Benning	256	397	637	723	934

TABLE C-4 - cont

	Mobile, AL	New Orleans, LA	Beaumont, TX	Houston, TX	Corpus Christi, TX
GEORGIA - cont					
Fort Gillem	324	466	706	792	1,003
Fort Gordon	457	599	839	925	1,135
Fort McPherson	325	466	704	790	1,001
Fort Stewart	446	587	827	914	1,124
Hunter MF	481	623	863	949	1,160
Albany MCLB	281	423	663	749	959
Moody AFB	329	470	710	796	1,007
Marietta NAS	339	481	704	790	1,001
Kings Bay NSB	444	585	825	912	1,122
Robins AFB	336	477	717	803	1,014
IDAHO					
Gowen Field	2,160	2,062	1,848	1,772	1,793
Mtn Home AFB	2,130	2,032	1,818	1,741	1,762
ILLINOIS					
Army Area SUPCOM	856	915	1,022	1,068	1,279
Joliet MP	825	882	983	1,025	1,236
Great Lakes NTC	888	951	1,058	1,104	1,315
Rock Island Ars	860	896	968	1,011	1,207
St. Louis ASC	856	915	1,022	1,068	1,279
Savanna Depot	906	951	1,023	1,065	1,271
Scott AFB	629	665	753	796	1,007
INDIANA					
Camp Attebury	676	778	934	987	1,198
Crane Ammo Actv	631	722	854	916	1,127
Fort B. Harrison	713	811	943	997	1,207
Crane NWC	633	723	855	918	1,129
Newport MP	695	772	905	953	1,164
IOWA					
Camp Dodge	973	972	899	902	1,069
Iowa AAP	844	876	928	970	1,148
KANSAS					
Fort Leavenworth	836	834	731	734	901
Fort Riley	938	909	744	725	863
Kansas MP	757	739	581	584	751
McConnell AFB	886	801	635	600	739
Sunflower MP	818	816	710	713	880

TABLE C-4 - cont

	Mobile, AL	New Orleans, LA	Beaumont, TX	Houston, TX	Corpus Christi, TX
KENTUCKY					
Fort Campbell	467	561	696	764	975
Fort Knox	569	671	836	905	1,116
Lexington Depot	638	747	918	987	1,198
LOUISIANA					
Barksdale AFB	402	306	199	242	453
Camp Beauregard	310	190	155	241	452
Fort Polk	346	224	98	184	395
Louisiana MP	378	308	221	264	474
MAINE					
Camp Keyes	1,532	1,653	1,871	1,957	2,168
Brunswick NAS	1,507	1,627	1,846	1,932	2,143
MARYLAND					
Aberdeen PG	1,020	1,141	1,360	1,446	1,657
Andrews AFB	959	1,082	1,300	1,386	1,597
Edgewood Ars	1,012	1,133	1,352	1,438	1,649
Fort Richie	968	1,076	1,295	1,381	1,592
Fort Detrick	964	1,072	1,291	1,377	1,588
Fort Meade	973	1,093	1,312	1,398	1,609
Bethesda NMC	952	1,073	1,292	1,378	1,589
Pax River NAS	957	1,098	1,318	1,404	1,615
MASSACHUSETTS					
Fort Devens	1,371	1,492	1,711	1,797	2,007
Hanscom AFB	1,374	1,495	1,714	1,800	2,011
S Weymouth NAS	1,388	1,508	1,727	1,813	2,024
Otis AFB	1,405	1,526	1,745	1,831	2,041
Westover AFB	1,313	1,433	1,652	1,738	1,949
MICHIGAN					
Tank-Auto Cmd	967	1,069	1,224	1,278	1,489
Camp Grayling	1,080	1,182	1,317	1,363	1,573
Detroit Arsenal	960	1,063	1,208	1,262	1,473
Selfridge ANGB	980	1,083	1,238	1,291	1,502

TABLE C-4 - cont

	Mobile, AL	New Orleans, LA	Beaumont, TX	Houston, TX	Corpus Christi, TX
MINNESOTA					
Camp Ripley	1,274	1,306	1,249	1,253	1,419
Fort Snelling	1,162	1,194	1,141	1,114	1,311
Twin Cities MP	1,174	1,206	1,155	1,158	1,324
MISSISSIPPI					
Camp Shelby	89	110	339	425	635
Columbus AFB	226	292	474	560	771
Keesler AFB	64	84	324	410	621
Meridian NAS	147	212	431	517	728
Gulfport NCBC	73	75	315	401	611
MISSOURI					
Camp Clark	739	728	619	633	799
Fort Leonard Wood	647	674	680	718	896
Gateway MP	640	672	736	779	990
Lake City MP	803	802	718	727	894
Whiteman AFB	757	767	722	742	908
MONTANA					
Malmstrom AFB	2,023	2,013	1,829	1,792	1,846
NEBRASKA					
Offutt AFB	984	982	853	857	1,023
Sioux Army Depot	1,349	1,287	1,109	1,073	1,136
NEVADA					
Hawthorne MP	2,130	2,032	1,806	1,730	1,705
Nellis AFB	1,819	1,721	1,495	1,419	1,395
NEW JERSEY					
Belle Meade GD	1,135	1,255	1,474	1,560	1,771
Fort Dix	1,120	1,241	1,459	1,545	1,756
Fort Monmouth	1,155	1,276	1,494	1,581	1,791
Camp Kilmer	1,142	1,263	1,482	1,568	1,778
McGuire AFB	1,120	1,241	1,459	1,545	1,756
NWS, Earle	1,150	1,270	1,489	1,575	1,786

TABLE C-4 - cont

	Mobile, AL	New Orleans, LA	Beaumont, TX	Houston, TX	Corpus Christi, TX
NEW MEXICO					
Cannon AFB	1,025	926	702	626	647
Holloman AFB	1,169	1,071	833	757	747
Kirtland AFB	1,238	1,140	916	840	861
White Sands MR	1,240	1,120	859	782	738
NEW YORK					
Army Pictorial Ctr	1,180	1,301	1,519	1,605	1,816
Fort Drum	1,341	1,443	1,610	1,679	1,890
Fort Hamilton	1,169	1,290	1,509	1,595	1,806
Fort Wadsworth	1,166	1,287	1,505	1,591	1,802
Griffiss AFB	1,300	1,409	1,584	1,652	1,863
Hancock Field	1,266	1,375	1,544	1,612	1,823
Seneca Depot	1,225	1,333	1,507	1,576	1,787
Stewart AFB	1,204	1,325	1,544	1,630	1,841
Watervliet Arsenal	1,297	1,405	1,624	1,710	1,921
NORTH CAROLINA					
Fort Bragg	676	818	1,058	1,144	1,354
New River MCAS	764	905	1,145	1,232	1,442
Cherry Pt MCAS	814	955	1,195	1,282	1,492
Camp Lejeune	764	906	1,146	1,232	1,442
Pope AFB	688	830	1,070	1,156	1,367
S. Johnson AFB	748	889	1,129	1,215	1,426
NORTH DAKOTA					
Camp Grafton	1,563	1,562	1,438	1,413	1,551
Grand Forks AFB	1,493	1,493	1,369	1,373	1,514
Minot AFB	1,652	1,651	1,527	1,494	1,615
OHIO					
Camp Perry	913	1,015	1,181	1,235	1,445
Def Const Spt Ctr	805	907	1,074	1,143	1,354
Def Elect Spt Ctr	745	847	1,014	1,083	1,293
Lima Tank Ctr	818	921	1,086	1,139	1,350
Ravenna MP	958	1,060	1,227	1,296	1,506
Rickenbacker Bur	800	902	1,069	1,138	1,348
W-Patterson AFB	753	856	1,022	1,091	1,302

TABLE C-4 - cont

	Mobile, AL	New Orleans, LA	Beaumont, TX	Houston, TX	Corpus Christi, TX
OKLAHOMA					
Altus AFB	815	717	504	466	550
Fort Sill	779	685	472	435	538
McAlester MP	641	552	388	391	557
Tinker AFB	740	651	485	454	592
OREGON					
Kingsley Field	2,476	2,378	2,162	2,086	2,063
Roberts Field	2,482	2,384	2,170	2,094	2,115
Umatilla AD Actv	2,410	2,311	2,098	2,021	2,042
PENNSYLVANIA					
Carlisle Barracks	1,007	1,116	1,334	1,421	1,631
Frankford Arsenal	1,093	1,214	1,433	1,519	1,729
Hayes MP	954	1,063	1,249	1,318	1,529
Letterkenny Depot	981	1,090	1,308	1,394	1,605
Willow Grove NAS	1,103	1,223	1,441	1,527	1,738
Phila NavSta	1,083	1,204	1,422	1,508	1,719
New Cumberland Dpt	1,026	1,135	1,353	1,439	1,650
M'burg Def Dpt	1,019	1,128	1,346	1,432	1,643
Scranton MP	1,141	1,250	1,468	1,555	1,765
Tobyhanna Depot	1,146	1,254	1,473	1,559	1,770
RHODE ISLAND					
Quonset Pt NAS	1,338	1,459	1,677	1,764	1,974
SOUTH CAROLINA					
Charleston AFB	588	727	967	1,053	1,263
Charleston Depot	580	722	962	1,048	1,259
Charleston NB	585	727	967	1,053	1,264
Fort Jackson	535	676	916	1,003	1,213
Beaufort MCAS	526	668	908	994	1,205
Parris Island	525	666	906	993	1,203
Charleston NSC	585	727	967	1,053	1,264
Shaw AFB	562	704	944	1,030	1,241
SOUTH DAKOTA					
Camp Rapid	1,488	1,484	1,314	1,278	1,347
Ellsworth AFB	1,488	1,484	1,314	1,278	1,348

TABLE C-4 - cont

	Mobile, AL	New Orleans, LA	Beaumont, TX	Houston, TX	Corpus Christi, TX
TENNESSEE					
Defense Depot	361	388	497	572	782
Holston MP	576	685	903	990	1,200
Milan MP	401	456	593	662	872
Memphis NAS	382	409	516	584	795
Volunteer MP	387	496	714	801	1,011
TEXAS					
Bergstrom AFB	618	496	235	157	193
Brooks AFB	670	547	286	200	139
Camp Stanley	654	532	271	185	150
Corpus Christi Depot	695	573	311	225	14
Dyess AFB	780	681	435	358	392
Ellington AFB	479	356	95	18	224
Fort Bliss	1,207	1,084	823	747	702
Fort Hood	655	532	271	195	274
Fort S. Houston	666	543	282	196	147
Fort Walters	665	567	345	299	396
Goodfellow AFB	826	703	442	365	354
Kelly AFB	675	552	291	205	149
Lackland AFB	677	555	293	207	149
Laughlin AFB	830	708	446	360	276
Lone Star MP	471	392	270	301	512
Longhorn MP	440	342	204	235	446
Corpus Christi NAS	695	573	311	225	14
Kingsville NAS	1,808	584	323	237	41
Randolph AFB	653	531	269	183	154
Red River AD	478	399	265	295	506
Sheppard AFB	729	631	418	381	485
Reese AFB	930	832	606	530	551
UTAH					
Hill AFB	1,849	1,750	1,537	1,460	1,481
Tooele Depot	1,848	1,749	1,534	1,458	1,479

TABLE C-4 - cont

	Mobile, AL	New Orleans, LA	Beaumont, TX	Houston, TX	Corpus Christi, TX
VIRGINIA					
Cameron Station	944	1,065	1,283	1,369	1,580
Arlington Hall	944	1,065	1,284	1,370	1,581
Cheatham Annex	884	1,025	1,258	1,344	1,555
DGSC Richmond	845	986	1,218	1,305	1,516
Fort A.P. Hill	901	1,042	1,264	1,350	1,561
Fort Eustis	891	1,032	1,265	1,351	1,562
Fort Lee	831	972	1,205	1,291	1,502
Fort Myer	945	1,066	1,285	1,371	1,582
Fort Monroe	899	1,040	1,273	1,359	1,570
Fort Picket	808	950	1,182	1,268	1,479
Fort Story	903	1,045	1,277	1,364	1,574
Langley AFB	898	1,039	1,272	1,358	1,569
MCCDC Quantico	929	1,050	1,269	1,355	1,566
Norfolk NAS	891	1,033	1,265	1,352	1,562
Oceana NAS	900	1,042	1,274	1,360	1,571
Little Creek NAB	895	1,036	1,269	1,355	1,565
Yorktown NWS	888	1,029	1,262	1,348	1,559
Radford MP	707	815	1,034	1,120	1,331
WASHINGTON					
Camp Murray	2,645	2,554	2,340	2,264	2,285
Fort Lawton	2,625	2,553	2,339	2,263	2,284
Fort Lewis	2,645	2,554	2,340	2,264	2,285
Fairchild AFB	2,356	2,328	2,121	2,084	2,137
McChord AFB	2,641	2,549	2,335	2,259	2,280
Bremerton NSC	2,641	2,569	2,355	2,279	2,300
Yakima Center	2,512	2,413	2,200	2,123	2,144
WISCONSIN					
Badger MP	979	1,034	1,115	1,158	1,353
Fort McCoy	1,045	1,098	1,170	1,185	1,351
Gen Mitchell Fld	930	992	1,098	1,144	1,355
WYOMING					
Camp Guernsey	1,464	1,403	1,226	1,190	1,250
F. E. Warren AFB	1,448	1,367	1,160	1,123	1,176

APPENDIX D

DISTANCE BETWEEN PORTS

TABLE D-1
DISTANCE BETWEEN PORTS (NAUTICAL MILES)

Port of Debarkation	Port of Embarkation (CONUS)			
	Seattle WA	San Francisco CA	San Diego CA	Galveston* TX
Alaska, Valdez	1,188	1,624	2,052	6,390
Albania, Durres	9,721	8,946	8,544	6,071
Algeria, Oran	9,624	7,849	7,447	4,974
Argentina, Buenos Aires	9,449	8,674	8,272	6,419
Australia, Sydney	6,810	6,448	6,530	9,226
Azores, Ponta Delgada	7,443	6,668	6,266	3,750
Bangladesh, Chittagong	8,651	8,942	9,254	11,404
Belgium, Antwerp	8,847	8,082	7,680	4,989
Bermuda, Hamilton	5,723	4,948	4,546	1,864
Brazil, Rio de Janeiro	8,431	7,656	7,254	5,360
British Honduras, Belize	4,880	4,105	3,703	935
Burma, Rangoon	8,252	8,534	8,921	11,388
Chile, Valparaiso	5,916	5,140	4,738	4,168
China, Shanghai	5,220	5,502	5,793	10,351
Colombia, Buenaventura	4,158	3,383	2,981	1,904
Costa Rica, Limon	4,254	3,479	3,077	1,394
Crete, Souda Bay	9,567	8,792	8,390	6,201
Cuba, Guantanamo	4,753	3,978	3,578	1,278
Cyprus, Famagusta	10,363	9,588	9,186	6,713
Denmark, Copenhagen	9,409	8,634	8,232	5,541
Diego Garcia	9,370	9,652	10,039	10,181
Djibouti, Djibouti	11,608	10,913	10,511	8,024
Dom Rep, Santo Domingo	4,866	4,091	3,689	1,625
Egypt, Port Said	10,315	9,540	9,138	6,665
El Salvador, Acajutla	3,221	2,446	2,044	2,385
England, Liverpool	8,705	7,930	7,528	4,837
France, Le Havre	8,672	7,897	7,495	4,803
France, Marseilles	9,083	8,308	7,906	5,433
Finland, Helsinki	10,110	9,325	8,923	6,232
French Guiana, Cayenne	6,329	5,554	5,152	2,875
Germany, Bremerhaven	9,065	8,290	7,888	5,187
Greece, Piraeus	9,840	9,105	8,703	6,230
Guam, Apra	4,948	5,053	5,379	9,450
Guatamala, Puerto Barrios	4,887	4,112	3,710	1,041
Guiana, Georgetown	5,579	4,804	4,402	2,542
Hawaii, Honolulu	2,409	2,091	2,278	7,237
Hong Kong	5,768	6,044	6,432	10,819
Honduras, Puerto Cortex	4,796	4,021	3,619	1,001
Iceland, Reykjavik	8,162	7,387	6,985	4,228
India, Bombay	9,584	9,866	10,254	9,714
Iran, Bandar Abbas	13,156	12,381	11,979	9,492
Iran, Bander-E-Khoumeini	13,363	12,861	12,459	9,972
Iran, Bushehr	10,880	11,162	11,549	9,671

TABLE D-1 - cont

Port of Debarkation	Port of Embarkation (CONUS) Seattle WA	San Francisco CA	San Diego CA	Galveston* TX
Iran, Chah Bahar	12,940	12,165	11,763	9,276
Israel, Haifa	10,403	9,628	9,226	6,753
Italy, Livorno	9,295	8,520	8,118	5,609
Jamaica, Kingston	4,614	3,839	3,437	1,246
Japan, Yokohama	4,254	4,536	4,923	9,234
Kenya, Mombasa	11,130	11,412	11,799	9,671
Korea, Pusan	4,919	5,201	5,512	10,422
Kuwait	10,976	11,258	11,645	9,903
Lebanon, Beirut	10,406	9,631	9,229	6,756
Malaysia, Penang	7,429	8,102	8,103	11,398
Malta, Marsaxlokk	9,389	8,614	8,212	5,739
Marshall Islands, Jaluit	4,296	4,150	4,394	8,218
Mexico, Veracruz	5,484	4,709	4,307	623
Morocco, Casablanca	8,372	7,597	7,195	4,722
Netherlands, Rotterdam	8,862	8,096	7,685	5,192
New Zealand, Auckland	6,170	5,680	5,655	8,068
Nicaragua, Corinto	3,388	2,613	2,211	2,235
Norway, Olso	9,355	8,580	8,178	5,487
Pakistan, Karachi	10,025	10,307	10,694	9,530
Panama, Colon	4,064	3,289	2,887	1,508
Peru, Callao	4,764	3,989	3,585	2,902
Philippines, Manila	6,828	6,299	6,604	10,922
Portugal, Lisbon	8,216	7,441	7,039	4,539
Puerto Rico, San Juan	5,056	4,281	3,879	1,715
Russia, Lenningrad	9,108	8,333	7,931	5,248
Ryukyu Island, Nakagusuku	5,093	5,375	5,762	10,073
Saudi Arabia, Ad Damman	10,825	11,106	11,493	9,807
Saudi Arabia, Jidda	11,036	10,261	9,859	7,372
Singapore	7,062	7,735	7,736	11,683
Somalia, Mogadishu	12,807	12,032	11,630	9,143
South Africa, Capetown	10,552	9,777	9,375	7,482
South Yemen, Aden	10,774	11,056	11,443	8,065
Spain, Rota	8,352	7,577	7,175	4,702
Sweden, Stockholm	9,968	9,193	8,791	6,110
Taiwan, Tan-shui	5,400	5,682	6,069	10,380
Thailand, Ban Satlahip	7,557	7,839	8,226	12,097
Trinidad, Port of Spain	5,223	4,448	4,046	2,213
Tunisia, Bizerte	9,141	8,366	7,640	5,491
Turkey, Iskenderun	10,426	9,653	9,249	6,776
UAE, Abu Dhabi	13,258	12,483	12,081	9,594
Uruguay, Montevideo	8,264	7,488	7,101	6,342
Venezuela, LaGuaira	4,905	4,130	3,728	1,938
Vietnam, Ho Chi Minh City	6,673	6,878	7,267	11,653
Virgin Islands, St. Thomas	5,092	4,317	3,915	1,785
Yugoslavia, Rijeka	10,020	9,245	8,843	6,410

TABLE D-1 - cont

Port of Debarkation	Port of Embarkation (CONUS) Mobile AL	Jacksonville** FL	Norfolk VA	New York NY
Alaska, Valdez	6,183	6,329	6,592	6,787
Albania, Durres	5,844	5,089	4,688	4,540
Algeria, Oran	4,747	3,922	3,591	3,443
Argentina, Buenos Aires	6,281	5,808	5,824	5,871
Australia, Sydney	9,088	9,234	9,497	9,692
Azores, Ponta Delgada	3,523	2,776	2,401	2,247
Bangladesh, Chittagong	11,177	10,422	10,021	9,873
Belgium, Antwerp	4,762	3,974	3,617	3,468
Bermuda, Hamilton	1,637	965	683	696
Brazil, Rio de Janeiro	5,133	4,707	4,723	4,762
British Honduras, Belize	846	1,047	1,503	1,703
Burma, Rangoon	11,161	10,406	10,005	9,857
Chile, Valparaiso	4,053	4,176	4,439	4,634
China, Shanghia	10,213	10,208	10,471	10,666
Colombia, Buenaventura	1,789	1,912	2,175	2,370
Costa Rica, Limon	1,292	1,589	1,852	2,047
Crete, Souda Bay	5,974	5,219	4,818	4,670
Cuba, Guantanamo	1,109	851	1,117	1,312
Cyprus, Famagusta	6,486	5,731	5,330	5,182
Denmark, Copenhagen	5,314	4,409	3,999	3,840
Diego Garcia	9,954	9,057	8,656	8,508
Djibouti	7,797	7,057	6,652	6,493
Dom Rep, Santo Domingo	1,487	1,166	1,329	1,489
Egypt, Port Said	6,438	5,683	5,282	5,134
El Salvador, Acajutla	2,270	2,493	2,656	2,851
England, Liverpool	4,610	3,709	3,362	3,242
France, Le Havre	4,576	3,788	3,431	3,282
France, Marseilles	5,206	4,451	4,050	3,902
Finland, Helsinki	6,005	5,100	4,690	4,531
French Guiana, Cayenne	2,648	2,294	2,394	2,447
Germany, Bremerhaven	4,960	4,182	3,825	3,676
Greece, Piraeus	6,003	5,240	4,847	4,699
Guam, Apra	9,312	9,548	9,811	10,006
Guatamala, Puerto Barrios	950	1,144	1,603	1,804
Guiana, Georgetown	2,404	1,980	2,090	2,217
Hawaii, Honolulu	6,099	6,245	6,508	6,703
Hong Kong	10,681	10,755	11,018	11,213
Honduras, Puerto Cortex	915	1,109	1,568	1,764
Iceland, Reykjavik	4,001	2,565	2,677	2,495
India, Bombay	9,487	8,751	8,350	8,202
Iran, Bandar Abbas	9,265	8,525	8,120	7,965
Iran, Bander-E-Khomeini	9,745	9,005	8,600	8,445
Iran, Bushehr	9,444	8,689	8,288	8,140
Iran, Chah Bahar	9,049	8,309	7,904	7,749
Israel, Haifa	6,526	5,771	5,370	5,222
Italy, Livorno	5,382	4,627	4,226	4,078

TABLE D-1 - cont

Port of Debarkation	Port of Embarkation (CONUS) Mobile AL	Jacksonville** FL	Norfolk VA	New York NY
Jamaica, Kingston	1,108	1,016	1,279	1,474
Japan, Yokohama	9,096	9,242	9,505	9,700
Kenya, Mombasa	9,444	8,689	8,288	8,140
Korea, Pusan	10,284	10,430	10,693	10,888
Kuwait	9,676	8,921	8,520	8,372
Lebanon, Beirut	6,529	5,774	5,373	5,225
Malaysia, Penang	11,171	10,416	10,015	9,867
Malta, Marsaxlokk	5,512	4,757	4,356	4,208
Marshall Islands, Jaluit	8,080	8,226	8,489	8,684
Mexico, Veracruz	825	1,315	1,789	1,989
Morocco, Casablanca	4,495	3,740	3,339	3,191
Netherlands, Rotterdam	4,965	3,979	3,622	3,473
New Zealand, Auckland	7,930	8,076	8,339	8,534
Nicaragua, Corinto	2,320	2,243	2,506	2,701
Norway, Olso	5,257	4,333	3,923	3,764
Pakistan, Karachi	9,303	8,548	8,147	7,999
Panama, Colon	1,393	1,516	1,779	1,974
Peru, Callao	2,787	2,910	3,173	3,368
Philippines, Manila	10,784	10,930	11,193	11,388
Portugal, Lisbon	4,302	3,541	3,147	2,988
Puerto Rico, San Juan	1,488	1,121	1,252	1,399
Russia, Lenningrad	5,021	5,230	4,811	4,661
Ryukyu Island, Nakagusuku	9,935	10,081	10,344	10,539
Saudi Arabia, Ad Damman	9,580	8,825	8,424	8,276
Saudi Arabia, Jidda	7,145	6,405	6,000	5,845
Singapore	11,456	10,701	10,300	10,152
Somalia, Mogadishu	8,916	8,176	7,771	7,616
South Africa, Capetown	7,255	6,862	6,802	6,801
South Yemen, Aden	7,838	7,083	6,682	6,534
Spain, Rota	4,475	3,740	3,339	3,191
Sweden, Stockholm	5,883	4,826	4,416	4,257
Taiwan, Tan-shui	10,242	10,388	10,651	10,846
Thailand, Ban Satlahip	11,870	11,115	10,714	10,566
Trinidad, Port of Spain	2,004	1,685	1,799	1,939
Tunisia, Bizerte	5,264	4,509	4,108	3,960
Turkey, Iskenderun	6,549	5,794	5,393	5,182
UAE, Abu Dhabi	9,367	8,627	8,222	8,067
Uruguay, Montevideo	6,115	5,727	5,710	5,753
Venezuela, LaGuaira	1,800	1,527	1,687	1,848
Vietnam, Ho Chi Minh City	11,515	11,350	10,949	10,801
Virgin Islands, St. Thomas	1,558	1,181	1,296	1,434
Yugoslavia, Rijeka	6,183	5,388	4,987	4,839

*For distance to Houston, TX, add 50 miles; for Beaumont, TX, add 70 miles.
**For distance to Savannah, GA, add 46 miles.

Source:
Defense Mapping Agency Pub 151, Distances Between Ports, 1991.

TABLE D-2
ESTIMATED TRANSIT TIMES

Distance (nautical mi)	Speed in Knots 08 Days-Hours	09 Days-Hours	10 Days-Hours	11 Days-Hours	12 Days-Hours	13 Days-Hours	14 Days-Hours	15 Days-Hours	16 Days-Hours	17 Days-Hours
50	0-06	0-06	0-05	0-05	0-04	0-04	0-04	0-03	0-03	0-03
100	0-13	0-11	0-10	0-09	0-08	0-08	0-07	0-07	0-06	0-06
200	1-01	0-22	0-20	0-18	0-17	0-15	0-14	0-13	0-13	0-12
300	1-14	1-09	1-06	1-03	1-01	0-23	0-21	0-20	0-19	0-18
400	2-02	1-20	1-16	1-12	1-09	1-07	1-05	1-03	1-01	1-00
500	2-15	2-08	2-02	1-21	1-18	1-14	1-12	1-09	1-07	1-05
600	3-03	2-19	2-12	2-07	2-02	1-22	1-19	1-16	1-14	1-11
700	3-16	3-06	2-22	2-16	2-10	2-06	2-02	1-23	1-20	1-17
800	4-04	3-17	3-08	3-01	2-19	2-14	2-09	2-05	2-02	1-23
900	4-17	4-04	3-18	3-10	3-03	2-21	2-16	2-12	2-08	2-05
1,000	5-05	4-15	4-04	3-19	3-11	3-05	2-23	2-19	2-15	2-11
2,000	10-10	9-06	8-08	7-14	6-23	6-10	5-23	5-13	5-05	4-22
3,000	15-15	13-21	12-12	11-09	10-10	9-15	8-22	8-08	7-20	7-08
4,000	20-20	18-12	16-16	15-04	13-21	12-20	11-22	11-03	10-10	9-19
5,000	26-01	23-04	20-20	18-23	17-09	16-01	14-21	13-21	13-01	12-06
6,000	31-06	27-19	25-00	22-17	20-20	19-06	17-21	16-16	15-15	14-17
7,000	36-11	32-10	29-04	26-12	24-07	22-11	20-19	19-11	18-06	17-04
8,000	41-16	37-01	33-08	30-07	27-18	25-16	23-19	22-06	20-21	19-15
9,000	46-21	41-16	37-12	34-02	31-05	28-21	26-18	25-01	23-12	22-02
10,000	52-02	46-07	41-16	37-21	34-16	32-02	29-17	27-20	26-03	24-13

TABLE D-2 - cont

Distance (nautical mi	Speed in Knots 18 Days-Hours	19 Days-Hours	20 Days-Hours	21 Days-Hours	22 Days-Hours	23 Days-Hours	24 Days-Hours	25 Days-Hours	30 Days-Hours
50	0-03	0-03	0-03	0-02	0-02	0-02	0-02	0-02	0-02
100	0-06	0-05	0-05	0-05	0-05	0-04	0-04	0-04	0-03
200	0-11	0-11	0-10	0-10	0-09	0-09	0-08	0-08	0-07
300	0-17	0-16	0-15	0-14	0-14	0-13	0-13	0-12	0-10
400	0-22	0-21	0-20	0-19	0-18	0-17	0-17	0-16	0-13
500	1-04	1-02	1-01	1-00	0-23	0-22	0-21	0-20	0-17
600	1-09	1-08	1-06	1-05	1-03	1-02	1-01	1-00	0-20
700	1-15	1-13	1-11	1-09	1-08	1-06	1-05	1-04	0-23
800	1-20	1-16	1-15	1-14	1-12	1-11	1-09	1-08	1-03
900	2-02	1-23	1-21	1-19	1-17	1-15	1-14	1-12	1-06
1,000	2-08	2-05	2-02	2-00	1-21	1-19	1-18	1-16	1-09
2,000	4-15	4-09	4-04	3-23	3-19	3-15	3-11	3-08	2-19
3,000	6-23	6-14	6-06	5-23	5-16	5-10	5-05	5-00	4-04
4,000	9-06	8-19	8-08	7-22	7-14	7-06	6-23	6-16	5-13
5,000	11-14	10-23	10-10	9-22	9-11	9-01	8-16	8-08	6-23
6,000	13-21	13-04	12-12	11-22	11-09	10-21	10-10	10-00	8-08
7,000	16-05	15-09	14-14	13-22	13-06	12-16	12-04	11-16	9-17
8,000	18-13	17-14	16-16	15-22	15-03	14-11	13-22	13-08	11-02
9,000	20-21	19-19	18-18	17-22	17-00	16-06	15-16	15-00	12-11
10,000	23-05	22-00	20-20	19-22	18-21	18-01	17-10	16-16	13-20

NOTE:
When a vessel is to pass through the Panama Canal or Suez Canal, 16 hours should be added be added to the estimated transit times.

Source:
Defense Mapping Agency Pub 151, Distances Between Ports, 1991.

APPENDIX E

SURFACE (LAND) MILEAGE BETWEEN CONUS MILITARY ACTIVITIES AND MAJOR AIRPORT OF EMBARKATION

NOTE:
Distances contained in these mileage tables represent the shortest highway route between the CONUS military activities and major airports of embarkation.

TABLE E-1
SURFACE (LAND) MILEAGE BETWEEN CONUS
MILITARY ACTIVITIES AND MAJOR AIRPORTS of EMBARKATION

	Charleston	Dover	McGuire	Norfolk
ALABAMA				
Anniston Depot	377	803	898	659
Fort McClellan	372	791	886	654
Fort Rucker	415	927	1024	753
Maxwell AFB	422	883	980	728
Redstone Arsenal	466	792	887	702
ARIZONA				
Davis-Monthan AFB	1982	2312	2335	2263
Fort Huachuca	1969	2299	2323	2251
Luke AFB	2092	2354	2378	2342
Yuma MCAS	2218	2501	2525	2488
ARKANSAS				
Camp Robinson	794	1102	1197	1027
Fort Chaffee	932	1240	1299	1165
Little Rock AFB	790	1098	1186	1023
Pine Bluff Arsenal	813	1122	1216	1047
CALIFORNIA				
Alameda Nav Fac	2759	2863	2867	2916
Beale AFB	2784	2779	2783	2832
Camp Roberts	2599	2845	2869	2833
Castle AFB	2655	2824	2832	2875
Fort H. Liggett	2628	2874	2898	2862
Fort Irwin	2371	2617	2641	2605
Fort Ord	2699	2933	2941	2932
Letterman AMC	2770	2872	2876	2925
McClellan AFB	2774	2774	2778	2828
El Toro MCAS	2431	2692	2716	2680
MCAGCC 29 Palms	2328	2574	2597	2561
Camp Pendleton	2426	2687	2711	2675
Barstow MCLB	2349	2594	2618	2582
San Diego MCRD	2396	2679	2702	2666
Lemoore NAS	2576	2821	2845	2809
Los Alamitos NAS	2437	2699	2723	2687
Miramar NAS	2394	2677	2701	2665
Moffett Fld NAS	2738	2893	2897	2946
Long Beach NSC	2445	2707	2731	2695
San Diego NSC	2395	2678	2702	2666
Concord NWS	2760	2851	2855	2904

TABLE E-1 - cont

	Charleston	Dover	McGuire	Norfolk
CALIFORNIA (cont)				
Seal Beach NWS	2435	2697	2721	2685
Oakland Base	2760	2862	2866	2915
Presidio of Mont	2703	2940	2949	2936
Presidio of SF	2770	2872	2876	2925
Riverbank AAP	2703	2810	2818	2861
Sacramento Depot	2765	2786	2790	2840
Sharpe Depot	2714	2826	2830	2880
Sierra Depot	2706	2701	2705	2754
Tracy Def Depot	2706	2840	2844	2894
Travis AFB	2778	2823	2827	2877
March AFB	2396	2658	2681	2645
COLORADO				
Camp West	1677	1697	1721	1748
Fitzsimons AMC	1661	1682	1706	1733
Fort Carson	1644	1698	1722	1730
Lowery AFB	1664	1684	1708	1735
Peterson AFB	1635	1689	1713	1721
Pueblo Depot	1606	1704	1728	1726
Rocky Mtn Arsenal	1660	1681	1705	1732
WASH DC				
Bolling AFB	504	100	196	182
Fort McNair	504	100	196	184
Walter Reed AMC	509	100	192	189
FLORIDA				
Camp Blanding	274	832	935	649
Eglin AFB	496	1014	1111	844
Homestead AFB	604	1162	1265	979
MacDill AFB	433	991	1094	808
Jacksonville NAS	250	808	911	625
Pensacola NAS	545	1047	1144	892
Key West NAS	742	1300	1403	1117
Mayport NavSta	251	809	912	625
Patrick AFB	409	967	1069	783
Tyndall AFB	455	1000	1101	826
Whiting Fld NAS	525	1012	1109	858
GEORGIA				
Dobbins AFB	295	720	817	566
Fort Benning	344	832	929	667

TABLE E-1 - cont

	Charleston	Dover	McGuire	Norfolk
GEORGIA - cont				
Fort Gillem	282	726	823	571
Fort Gordon	142	631	731	457
Fort McPherson	285	722	819	567
Fort Stewart	145	703	806	520
Hunter AAP	114	672	775	489
Albany MCLB	310	828	929	655
Moody AFB	274	832	934	649
Marietta NAS	298	723	821	569
Kings Bay NSB	214	772	875	589
Robins AFB	255	757	854	583
IDAHO				
Gowen Field	2434	2429	2430	2482
Mtn Home AFB	2403	2398	2400	2452
ILLINOIS				
Army Area SUPCOM	878	778	771	853
Joliet MP	866	784	788	859
Great Lakes NTC	910	810	803	885
Rock Island Ars	993	913	917	988
St. Louis ASC	878	778	771	853
Savanna Depot	1014	913	909	988
Scott AFB	800	878	902	884
INDIANA				
Camp Attebury	662	660	684	691
Crane Ammo Actv	671	728	762	730
Fort B. Harrison	699	644	667	695
Crane NWC	673	726	760	732
Newport MP	751	714	738	765
IOWA				
Camp Dodge	1158	1087	1091	1162
Iowa AAP	997	950	960	1001
KANSAS				
Fort Leavenworth	1097	1150	1174	1183
Fort Riley	1208	1272	1296	1294
Kansas MP	1057	1217	1241	1225
McConnell AFB	1191	1320	1344	1337
Sunflower MP	1094	1158	1182	1180

TABLE E-1 - cont

	Charleston	Dover	McGuire	Norfolk
KENTUCKY				
Fort Campbell	580	811	874	736
Fort Knox	586	695	733	669
Lexington Depot	521	586	642	560
LOUISIANA				
Barksdale AFB	875	1279	1374	1157
Camp Beauregard	832	1236	1331	1114
Fort Polk	898	1302	1398	1180
Louisiana MP	851	1255	1350	1133
MAINE				
Camp Keyes	1085	522	395	691
Brunswick NAS	1060	497	370	666
MARYLAND				
Aberdeen PG	574	67	127	245
Andrews AFB	509	96	196	180
Edgewood Ars	566	77	137	237
Fort Richie	568	159	196	256
Fort Detrick	564	134	198	231
Fort Meade	527	90	172	202
Bethesda NMC	511	106	195	193
Pax River NAS	507	133	239	178
MASSACHUSETTS				
Fort Devens	925	362	234	531
Hanscom AFB	928	364	238	534
S Weymouth NAS	941	378	251	547
Otis AFB	959	396	268	565
Westover AFB	866	303	176	472
MICHIGAN				
Tank-Auto Cmd	822	612	602	690
Camp Grayling	993	784	774	862
Detroit Arsenal	815	605	595	684
Selfridge ANGB	835	625	615	703

TABLE E-1 - cont

	Charleston	Dover	McGuire	Norfolk
MINNESOTA				
Camp Ripley	1374	1273	1263	1349
Fort Snelling	1268	1168	1160	1243
Twin Cities MP	1274	1173	1162	1248
MISSISSIPPI				
Camp Shelby	656	1069	1164	947
Columbus AFB	545	936	1030	827
Keesler AFB	646	1107	1204	953
Meridian NAS	576	980	1075	858
Gulfport NCBC	656	1117	1214	962
MISSOURI				
Camp Clark	1034	1151	1175	1167
Fort Leonard Wood	904	1020	1044	1036
Gateway MP	823	893	917	909
Lake City MP	1051	1115	1139	1137
Whiteman AFB	1008	1090	1114	1111
MONTANA				
Malmstrom AFB	2243	2142	2132	2218
NEBRASKA				
Offutt AFB	1238	1212	1216	1267
Sioux Army Depot	1603	1598	1602	1652
NEVADA				
Hawthorne MP	2559	2644	2649	2695
Nellis AFB	2248	2433	2456	2482
NEW JERSEY				
Belle Meade GD	688	125	9	302
Fort Dix	673	110	44	276
Fort Monmouth	703	145	36	293
Camp Kilmer	696	133	7	308
McGuire AFB	697	134	-	310
NWS, Earle	700	140	32	291

TABLE E-1 - cont

	Charleston	Dover	McGuire	Norfolk
NEW MEXICO				
Cannon AFB	1484	1752	1776	1724
Fort Wingate	1795	2040	2064	2028
Holloman AFB	1642	1972	1995	1924
Kirtland AFB	1667	1913	1936	1900
White Sands MR	1713	2043	2066	1994
NEW YORK				
Army Pictorial Ctr	733	170	43	340
Fort Drum	941	399	302	578
Fort Hamilton	723	160	33	327
Fort Wadsworth	719	156	29	323
Griffiss AFB	889	343	240	522
Hancock Field	865	322	235	502
Plattsburgh AFB	1017	454	326	624
Seneca Depot	826	322	235	501
Stewart AFB	758	195	68	364
Watervliet Arsenal	867	304	176	474
NORTH CAROLINA				
Fort Bragg	206	418	519	248
New River MCAS	218	384	510	201
Cherry Pt MCAS	269	363	489	179
Camp Lejeune	221	382	508	198
Pope AFB	202	405	505	232
S. Johnson AFB	246	354	467	171
NORTH DAKOTA				
Camp Grafton	1668	1555	1549	1634
Grand Forks AFB	1596	1483	1473	1562
Minot AFB	1783	1682	1672	1758
OHIO				
Camp Perry	745	513	503	591
Def Const Spt Ctr	626	471	495	531
Def Elect Spt Ctr	647	543	567	584
Lima Tank Ctr	712	557	563	624
Ravenna MP	695	392	382	476
Rickenbacker Bur	616	477	501	526
W-Patterson AFB	652	534	558	588

TABLE E-1 - cont

	Charleston	Dover	McGuire	Norfolk
OKLAHOMA				
Altus AFB	1248	1521	1545	1482
Fort Sill	1193	1466	1490	1427
McAlester MP	1030	1338	1374	1263
Tinker AFB	1107	1387	1411	1340
Vance AFB	1171	1396	1419	1399
OREGON				
Kingsley Field	2795	2790	2793	2843
Roberts Field	2756	2751	2752	2804
Umatilla AD Actv	2683	2675	2664	2732
PENNSYLVANIA				
Carlisle Barracks	606	142	154	288
Frankford Arsenal	647	84	51	263
Hayes MP	625	309	326	391
Letterkenny Depot	581	170	184	279
Willow Grove NAS	657	94	49	273
Phila NavSupAct	636	73	62	253
New Cumberland Dpt	614	127	143	288
Scranton MP	731	184	99	364
Tobyhanna Depot	724	167	78	346
RHODE ISLAND				
Quonset Pt NAS	892	328	201	498
SOUTH CAROLINA				
Charleston AFB	-	594	697	411
Charleston NB	4	596	699	413
Fort Jackson	110	544	644	370
Beaufort MCAS	66	638	741	455
Parris Island	73	645	748	462
Myrtle Beach AFB	95	507	615	324
Charleston NSC	4	596	699	413
Shaw AFB	96	536	639	353
SOUTH DAKOTA				
Camp Rapid	1733	1654	1649	1729
Ellsworth AFB	1734	1649	1644	1724

TABLE E-1 - cont

	Charleston	Dover	McGuire	Norfolk
TENNESSEE				
Defense Depot	651	965	1059	890
Holston MP	345	487	582	413
Milan MP	641	880	967	806
Memphis NAS	674	949	1041	874
Volunteer MP	392	673	768	584
TEXAS				
Bergstrom AFB	1194	1591	1686	1476
Brooks AFB	1252	1670	1764	1551
Camp Stanley	1237	1658	1752	1536
Corpus Christi Depot	1278	1699	1794	1577
Dyess AFB	1253	1610	1695	1534
Ellington AFB	1061	1483	1578	1361
Fort Bliss	1690	2047	2077	1971
Fort Hood	1165	1552	1646	1447
Fort S. Houston	1248	1662	1757	1545
Goodfellow AFB	1321	1687	1781	1603
Kelly AFB	1257	1673	1767	1555
Lackland AFB	1260	1675	1770	1557
Laughlin AFB	1413	1827	1921	1709
Lone Star MP	916	1253	1348	1178
Longhorn MP	913	1314	1408	1195
Corpus Christi NAS	1278	1699	1794	1577
Dallas NAS	1075	1432	1526	1357
Kingsville NAS	1289	1710	1805	1588
Randolph AFB	1236	1653	1748	1535
Red River AD	923	1259	1354	1184
Sheppard AFB	1181	1571	1543	1442
Reese AFB	1399	1736	1761	1661
UTAH				
Hill AFB	2125	2119	2124	2173
Tooele Depot	2176	2171	2175	2224

TABLE E-1 - cont

	Charleston	Dover	McGuire	Norfolk
VIRGINIA				
Cameron Station	496	109	205	183
Arlington Hall	501	105	200	188
Cheatham Annex	426	222	343	50
DGSC Richmond	391	205	306	94
Fort Belvoir	484	119	215	171
Fort A.P. Hill	451	151	252	122
Fort Eustis	423	213	339	32
Fort Lee	375	222	322	80
Fort Myer	501	104	199	188
Fort Monroe	418	196	322	15
Fort Picket	363	250	350	118
Fort Story	423	186	312	13
Langley AFB	417	199	325	18
MCCDC Quantico	481	135	230	168
Norfolk NAS	411	188	314	5
Oceana NAS	419	190	316	13
Litle Creek NAB	414	182	308	4
Yorktown NWS	427	216	342	35
Radford MP	347	356	451	286
Vint Hills FS	495	138	233	184
WASHINGTON				
Fort Lawton	2871	2782	2771	2857
Fort Lewis	2890	2802	2792	2877
Fairchild AFB	2601	2512	2502	2588
McChord AFB	2886	2797	2787	2873
Yakima Center	2784	2695	2685	2771
WISCONSIN				
Badger MP	1048	948	941	1022
Fort McCoy	1111	1010	1004	1085
WYOMING				
Camp Guernsey	952	852	845	927
F. E. Warren AFB	1703	1698	1702	1751

TABLE E-2
SURFACE (LAND) MILEAGE BETWEEN CONUS
MILITARY ACTIVITIES AND MAJOR AIRPORTS of EMBARKATION

	Tinker	McChord	Norton	Travis
ALABAMA				
Anniston Depot	742	2571	2011	2413
Fort McClellan	742	2570	2021	2414
Fort Rucker	863	2692	2039	2477
Maxwell AFB	774	2603	1962	2401
Redstone Arsenal	659	2468	1952	2330
ARIZONA				
Davis-Monthan AFB	944	1496	432	881
Fort Huachuca	932	1567	503	952
Luke AFB	1002	1362	305	754
Yuma MCAS	1149	1354	220	669
ARKANSAS				
Camp Robinson	325	2213	1619	1997
Fort Chaffee	180	2095	1473	1851
Little Rock AFB	327	2215	1620	1999
Pine Bluff Arsenal	355	2245	2649	2027
CALIFORNIA				
Alameda Nav Fac	1653	774	428	57
Beale AFB	1691	687	475	74
Camp Roberts	1493	958	268	242
Castle AFB	1548	833	335	123
Fort H. Liggett	1522	935	297	219
Fort Irwin	1265	1122	107	458
Fort Ord	1593	876	368	160
Letterman AMC	1663	782	439	66
McClellan AFB	1667	727	448	52
El Toro MCAS	1340	1148	58	438
MCAGCC 29 Palms	1221	1191	91	527
Camp Pendleton	1335	1192	93	482
Barstow MCLB	1242	1096	78	431
San Diego MCRD	1326	1224	109	514
Lemoore NAS	1469	929	250	220
Los Alamitos NAS	1347	1130	64	420
Miramar NAS	1325	1225	99	516
Moffett Fld NAS	1632	813	407	96
Long Beach NSC	1355	1130	72	421
San Diego NSC	1326	1232	111	522
Concord NWS	1653	761	429	45

TABLE E-2 - cont

	Tinker	McChord	Norton	Travis
CALIFORNIA - cont				
Seal Beach NWS	1345	1132	62	422
Oakland Base	1654	773	429	57
Presidio of Mont	1596	884	372	168
Presidio of SF	1663	782	439	66
Riverbank AAP	1597	803	377	93
Sacramento Depot	1659	729	439	46
Sharpe Depot	1607	777	385	67
Sierra Depot	1613	624	511	223
Tracy Def Depot	1599	790	375	81
Travis AFB	1672	736	451	-
March AFB	1305	1146	18	463
COLORADO				
Camp West	632	1298	976	1164
Fitzsimons AMC	617	1303	992	1181
Fort Carson	575	1371	1031	1220
Peterson AFB	580	1369	1034	1222
Pueblo Depot	526	1405	1020	1228
Rocky Mtn Arsenal	616	1302	992	1181
WASH DC				
Bolling AFB	1304	2715	2562	2741
Fort McNair	1301	2712	2560	2738
Walter Reed AMC	1296	2707	2555	2733
FLORIDA				
Camp Blanding	1108	2937	2304	2743
Eglin AFB	845	2730	2016	2454
Homestead AFB	1448	3277	2635	3074
MacDill AFB	1224	3053	2396	2834
Jacksonville NAS	1119	2932	2320	2759
Pensacola NAS	800	2700	1971	2409
Key West NAS	1581	3410	2769	3207
Mayport NavSTA	1127	2941	2331	2770
Patrick AFB	1267	3093	2462	2901
Tyndall AFB	912	2795	2083	2521
Whiting Fld NAS	814	2691	1986	2424
GEORGIA				
Dobbins AFB	816	2599	2107	2488
Fort Benning	841	2671	2055	2493

TABLE E-2 - cont

	Tinker	McChord	Norton	Travis
GEORGIA - cont				
Fort Gillem	838	2625	2114	2509
Fort Gordon	976	2760	2254	2648
Fort McPherson	828	2617	2104	2500
Fort Stewart	1062	2850	2279	2718
Hunter AAP	1077	2864	2294	2732
Albany MCLB	925	2754	2129	2567
Moody AFB	1003	2831	2206	2645
Marietta NAS	814	2598	2104	2486
Kings Bay NSB	1099	2913	2303	2742
Robins AFB	921	2712	2135	2573
IDAHO				
Gowen Field	1431	487	838	598
Mtn Home AFB	1400	541	814	615
ILLINOIS				
Army Area SUPCOM	787	2024	1965	2070
Joliet MP	743	2049	1953	2058
Great Lakes NTC	823	1998	1993	2098
Rock Island Ars	686	1903	1811	1916
St. Louis ASC	787	2024	1965	2070
Savanna Depot	750	1904	1864	1969
Scott AFB	523	2096	1781	2034
INDIANA				
Camp Attebury	759	2236	2018	2220
Crane Ammo Actv	702	2235	1961	2212
Fort B. Harrison	749	2209	2007	2193
Crane NWC	704	2233	1962	2210
Newport MP	694	2146	1936	2127
IOWA				
Camp Dodge	539	1728	1643	1748
Iowa AAP	628	1892	1779	1885
KANSAS				
Fort Leavenworth	357	1819	1517	1746
Fort Riley	286	1747	1410	1653
Kansas MP	222	1931	1459	1778
McConnell AFB	162	1800	1327	1646
Sunflower MP	340	1850	1500	1754

TABLE E-2 - cont

	Tinker	McChord	Norton	Travis
KENTUCKY				
Fort Campbell	650	2313	1913	2251
Fort Knox	768	2329	2031	2284
Lexington Depot	847	2389	2106	2359
LOUISIANA				
Barksdale AFB	350	2248	1512	1950
Camp Beauregard	466	2364	1627	2066
Fort Polk	461	2348	1609	2048
Louisiana MP	371	2270	1533	1972
MAINE				
Camp Keyes	1790	3113	3048	3154
Brunswick NAS	1766	3088	3023	3129
MARYLAND				
Aberdeen PG	1335	2736	2594	2763
Andrews AFB	1311	2722	2570	2748
Edgewood Ars	1327	2732	2586	2759
Fort Richie	1244	2644	2502	2670
Fort Detrick	1259	2669	2517	2696
Fort Meade	1303	2714	2561	2740
Bethesda NMC	1291	2702	2550	2728
Pax River NAS	1345	2772	2619	2798
MASSACHUSETTS				
Fort Devens	1638	2975	2897	3016
Hanscom AFB	1641	2985	2900	3026
S Weymouth NAS	1656	3014	2914	3054
Otis AFB	1673	3037	2932	3077
Westover AFB	1573	2915	2831	2955
MICHIGAN				
Tank-Auto Cmd	1030	2235	2237	2342
Camp Grayling	1088	2122	2268	2332
Detroit Arsenal	1014	2218	2220	2325
K. 1. Sawyer AFB	1113	1902	2163	2223
Selfridge ANGB	1044	2237	2251	2355

TABLE E-2 - cont

	Tinker	McChord	Norton	Travis
MINNESOTA				
Camp Ripley	861	1547	1815	1868
Fort Snelling	780	1631	1799	1863
Twin Cities MP	795	1635	1811	1875
MISSISSIPPI				
Camp Shelby	652	2560	1823	2262
Columbus AFB	614	2443	1867	2265
Keesler AFB	714	2611	1862	2311
Meridian NAS	660	2511	1831	2269
Gulfport NCBC	704	2602	1852	2302
MISSOURI				
Camp Clark	279	1936	1502	1821
Fort Leonard Wood	376	2035	1643	1962
Gateway MP	495	2076	1754	2014
Lake City MP	367	1849	1531	1782
Whiteman AFB	388	1904	1571	1837
MONTANA				
Malmstrom AFB	1366	666	1216	1117
NEBRASKA				
Offutt AFB	451	1658	1519	1624
Sioux Army Depot	640	1318	1142	1225
NEVADA				
Hawthorne MP	1452	798	377	280
Nellis AFB	1142	1094	241	566
NEW JERSEY				
Belle Meade GD	1414	2790	2673	2831
Fort Dix	1407	2806	2666	2837
Fort Monmouth	1439	2823	2697	2863
Camp Kilmer	1418	2794	2676	2834
McGuire AFB	1411	2787	2669	2827
NWS Earle	1433	2818	2692	2859

TABLE E-2 - cont

	Tinker	McChord	Norton	Travis
NEW MEXICO				
Cannon AFB	385	1633	933	1325
Holloman AFB	604	1637	742	1191
Kirtland AFB	560	1427	733	1111
White Sands MR	675	1646	680	1129
NEW YORK				
Army Pictorial Ctr	1448	2817	2706	2857
Fort Drum	1447	2770	2705	2810
Fort Hamilton	1443	2819	2702	2859
Fort Wadsworth	1440	2816	2698	2856
Griffiss AFB	1420	2743	2678	2784
Hancock Field	1395	2718	2653	2759
Seneca Depot	1344	2667	2602	2707
Stewart AFB	1472	2837	2731	2877
Watervliet Arsenal	1516	2839	2774	2880
NORTH CAROLINA				
Fort Bragg	1176	2815	2460	2799
New River MCAS	1275	2920	2552	2904
Cherry Pt MCAS	1309	2939	2602	2923
Camp Lejeune	1275	2920	2552	2904
Pope AFB	1186	2815	2472	2799
S. Johnson AFB	1234	2864	2527	2848
NORTH DAKOTA				
Camp Grafton	975	1334	1712	1682
Grand Forks AFB	937	1406	1767	1754
Minot AFB	1056	1222	1625	1574
OHIO				
Camp Perry	987	2285	2226	2331
Def Const Spt Ctr	917	2349	2176	2356
Def Elect Spt Ctr	854	2308	2112	2292
Lima Tank Ctr	892	2249	2150	2274
Ravenna MP	1064	2405	2323	2446
Rickenbacker Bur	920	2354	2179	2359
W-Patterson AFB	856	2311	2115	2295

TABLE E-2 - cont

	Tinker	McChord	Norton	Travis
OKLAHOMA				
Altus AFB	145	1858	1183	1561
Fort Sill	90	1913	1239	1617
McAlester MP	109	2026	1402	1780
Tinker AFB	-	1918	1293	1672
Vance AFB	94	1853	1285	1664
OREGON				
Kingsley Field	1759	426	708	323
Roberts Field	1753	276	870	473
Umatilla AD Actv	1680	243	1027	674
PENNSYLVANIA				
Carlisle Barracks	1263	2666	2521	2693
Frankford Arsenal	1381	2782	2640	2808
Hayes MP	1093	2489	2351	2516
Letterkenny Depot	1240	2640	2499	2667
Willow Grove NAS	1379	2772	2637	2808
Phila NavSupAct	1378	2778	2637	2805
New Cumberland Dpt	1276	2679	2535	2706
Scranton MP	1358	2719	2617	2759
Tobyhanna Depot	1368	2731	2626	2771
RHODE ISLAND				
Quonset Pt NAS	1606	2970	2865	3011
SOUTH CAROLINA				
Charleston AFB	1107	2886	2384	2778
Charleston NB	1110	2889	2385	2781
Fort Jackson	1046	2791	2323	2717
Beaufort MCAS	1086	2870	2332	2758
Parris Island	1093	2877	2330	2765
Charleston NSC	1110	2889	2385	2781
Shaw AFB	1073	2820	2351	2745
SOUTH DAKOTA				
Camp Rapid	843	1153	1263	1327
Ellsworth AFB	843	1157	1265	1329

TABLE E-2 - cont

	Tinker	McChord	Norton	Travis
TENNESSEE				
Defense Depot	457	2286	1751	2129
Holston MP	931	2585	2224	2555
Milan MP	547	2302	1840	2219
Memphis NAS	469	2298	1763	2141
Volunteer MP	777	2510	2071	2448
TEXAS				
Bergstrom AFB	402	2129	1306	1755
Brooks AFB	477	2142	1280	1729
Camp Stanley	469	2149	1287	1736
Corpus Christi Depot	606	2294	1430	1879
Dyess AFB	296	1902	1142	1591
Ellington AFB	471	2276	1479	1929
Fort Bliss	686	1687	721	1171
Fort Hood	359	2083	1293	1742
Fort S. Houston	473	2140	1278	1727
Goodfellow AFB	388	1931	1123	1572
Kelly AFB	479	2143	1281	1730
Lackland AFB	480	2142	1279	1728
Laughlin AFB	547	2027	1146	1596
Lone Star MP	269	2182	1489	1888
Longhorn MP	310	2218	1486	1922
Corpus Christi NAS	606	2294	1430	1880
Kingsville NAS	610	2286	1406	1855
Randolph AFB	464	2145	1282	1732
Red River AD	263	2176	1484	1882
Sheppard AFB	143	1921	1235	1625
Reese AFB	362	1747	1019	1439
UTAH				
Hill AFB	1122	801	672	717
Tooele Depot	1131	863	634	676

TABLE E-2 - cont

	Tinker	McChord	Norton	Travis
VIRGINIA				
Cameron Station	1298	2718	2556	2736
Arlington Hall	1259	2713	2554	2734
Cheatham Annex	1313	2835	2606	2839
DGSC Richmond	1261	2790	2554	2788
Fort A.P. Hill	1291	2751	2584	2769
Fort Eustis	1321	2843	2615	2847
Fort Lee	1265	2806	2559	2804
Fort Myer	1296	2712	2555	2735
Fort Monroe	1339	2860	2632	2864
Fort Picket	1232	2792	2525	2776
Fort Story	1352	2882	2645	2886
Langley AFB	1337	2858	2630	2862
MCCDC Quantico	1296	2717	2555	2735
Norfolk NAS	1340	2869	2633	2873
Oceana NAS	1349	2885	2642	2889
Litle Creek NAB	1343	2872	2636	2877
Yorktown NWS	1318	2839	2611	2844
Radford MP	1061	2643	2354	2627
WASHINGTON				
Fort Lawton	1922	43	1176	778
Fort Lewis	1922	5	1130	731
Fairchild AFB	1681	297	1197	842
McChord AFB	1918	-	1134	736
Yakima Center	1782	147	1081	684
WISCONSIN				
Badger MP	823	1856	1934	2018
Fort McCoy	821	1799	1894	1958
WYOMING				
Camp Guernsey	863	1964	1999	2104
F. E. Warren AFB	720	1222	1065	1129

APPENDIX F

MATHEMATICAL CONVERSION FACTORS FOR UNITS OF MEASURE

TO CONVERT	TO	MULTIPLY BY
1. Weight Measure		
a. Short Tons	Pounds	2,000.000
	Long Tons	0.893
	Metric Tons	0.907
	Kilograms	907.200
	Measurement Tons	*
b. Long Tons	Pounds	2,240.000
	Short Tons	1.120
	Metric Tons	1.016
	Kilograms	1,016.050
c. Metric Tons	Pounds	2,204.500
	Short Tons	1.102
	Long Tons	0.984
	Kilograms	1,000.000
2. Volumetric Measure		
a. Measurement Tons	Cubic Feet	40.000
	Board Feet	600.000
	Short Tons	*
b. Displacement Tons	Cubic Feet	35.000
c. Register Tons	Cubic Feet	100.000
d. Cubic Feet	Cubic Inches	1,728.000
	US Gallons	7.481
	Imperial Gallons	6.229
	US Barrels	0.178
	Liters	28.316
	Cubic Meters	0.028
	Measurement Tons	0.025
e. Cubic Feet of Lumber	Board Feet	12.000
f. US Gallons	Cubic Inches	231.000
	Cubic Feet	0.134
	Imperial Gallons	0.833
	Liters	3.785
	Cubic Meters	0.004

TO CONVERT	TO	MULTIPLY BY
2. Volumetric Measure - cont		
g. US Barrels (Liquid)	US Gallons	31.500
	Cubic Inches	7,276.000
	Cubic Feet	4.211
	Imperial Gallons	26.228
	Liters	119.230
	Cubic Meters	0.119
h. US Bushels	Cubic Feet	1.245
i. Imperial Bushels	Cubic Feet	1.284
3. Area Measure		
a. Square Feet	Square Yards	0.111
	Square Meters	0.093
b. Acres	Square Feet	43,560.000
	Square Yards	4,840.000
	Square Meters	4,047.000
	Hectares	0.405
c. Square Miles	Acres	640.000
	Hectares	259.000
	Square Kilometers	2.590
d. Square Meters	Square Feet	10.764
	Square Yards	1.196
e. Hectares	Square Yards	11,960.000
	Acres	2.471
	Square Meters	10,000.000
4. Linear Measure		
a. Feet	Inches	12.000
	Yards	0.333
	Centimeters	30.480
	Meters	0.305
b. Yards	Feet	3.000
	Meters	0.914

TO CONVERT	TO	MULTIPLY BY
4. Linear Measure - cont		
c. Rods	Feet	16.500
d. Statute Miles	Feet	5,280.000
	Yards	1,760.000
	Nautical Miles	0.869
	Meters	1,609.350
	Kilometers	1.609
5. Miscellaneous		
a. Miles per Hour	Feet per Minute	88.000
b. Barrels (Oil)	Gallons	42.000
c. Tons (Seawater)	Cubic Feet	35.000
d. Tons (Freshwater)	Cubic Feet	36.000
e. Cubic Feet (Seawater)	Pounds	65.000
f. Cubic Feet (Freshwater)	Pounds	62.000
g. Passenger Tons	Short Tons	9 Pax to 1 STON

*Depends on the commodity (see app G).

Legend:
Pax - Passengers

APPENDIX G

CONVERSION FACTORS FOR SHORT TONS AND MEASUREMENT TONS, BY COMMODITY

Commodity	STON per MTON	MTON per STON	Shipping Configuration
Helicopters:			
AH-1E	0.0422	23.69	Red AR-220-10
AH-1G	0.0266	37.61	Red for Sealift
AH-1S	0.0361	27.67	Red AR-220-10
AH-64A	0.0621	16.10	Red for C-141
CH-47C[1]	0.0475	21.03	Red for C-5
CH-47D[1]	0.0398	25.13	Red for Sealift
CH-54B	0.0508	19.69	Red for C-5
EH-1H	0.0455	22.00	Red for C-130
EH-1X	0.0259	38.67	Red for Sealift
EH-60A	0.0525	19.03	Red for Sealift
OH-58C	0.0346	29.02	Red for C-130
OH-6A	0.0149	67.10	Red for C-130
UH-1H	0.0338	29.62	Red for C-130
UH-1M	0.0357	27.97	Red for Sealift
UH-60A	0.0907	11.03	Red for C-141
Selected Unit Equipment:			
M1A1	0.7250	1.38	Red AR-220-10
M103A2	0.4958	2.02	Red AR-220-10
M110A2	0.4000	2.50	Red AR-220-10
M113A2	0.4449	2.25	Red AR-220-10
M113A3	0.4857	2.06	Red AR-220-10
M2A2	0.4780	2.09	Red AR-220-10
M3	0.4405	2.27	Red AR-220-10
M109A1	0.3470	2.88	Red AR-220-10
M48A3	0.7238	1.38	Red AR-220-10
M551A1	0.4235	2.36	Red AR-220-10
M60A2	0.7493	1.33	Red AR-220-10
M60A3	0.6206	1.61	Red AR-220-10
General Unit Equipment:			
Wheeled Vehicles[2]	0.2300	4.35	Red AR-220-10
Tracked Vehicles[2]	0.5310	1.88	Red AR-220-10
General Cargo[2]	0.2250	4.45	Red Ar-220-10
Small Arms/Ammo	1.000	1.00	NA
Ammunition (Mixed):			
US Army[3]	1.20	0.83	NA
US Air Force	0.63	1.59	NA
US Navy[3]	1.17	0.85	NA
US Marine Corps	1.03	0.97	NA
POL (Bulk):			
Diesel	1.050	0.952	NA
Mogas	0.926	1.080	NA
Aviation Gas	0.876	1.142	NA

Commodity	STON per MTON	MTON per STON
POL:		
Drum	0.667	1.50
JP-4	0.952	1.05
Cargo Carrying Trailers:	0.192	5.21
Class I (Subsistence):		
Refrigerated	0.500	2.00
Chill	0.714	1.40
Freeze	0.558	1.70
Other	0.476	2.10
Class II:	0.358	2.80
Class III:	0.667	1.50
Class IV:		
General	0.667	1.50
Clothing/Textiles	0.286	3.50
General Stores:	0.556	1.80
General:		
Less Household Goods	0.430	2.32
Household Goods	0.140	7.10
POVs	0.133	7.54
Transportation Equipment:	0.125	8.00
Construction Equipment:	0.667	1.50
Weighted Average:		
Mixed Cargo (Less A/C)	0.352	2.84
Mixed Dry Cargo (Less A/C)	0.413	2.42

Notes: Helicopter STON/MTON conversions include removed components.
[1] Rotor blades shipped in cargo compartment of CH-47's.
[2] Based on equipment in the six Army-type divisions.
[3] MTMCTEA Report OA 78-10a-13, Ammunition Ocean Terminal Expansion Plans Analysis, May 1979.

Legend:
Red - Reduced IAW/for
A/C - Aircraft

APPENDIX H

KEY POINTS OF CONTACT FOR STRATEGIC MOBILITY PLANNING

	ACTIVITY/ OFFICE/CODE	TELEPHONE NUMBER	ADDRESS
A.	USTRANSCOM TCJ3/4	COM-618-256-6283 DSN-576-6283/6897	Commander in Chief US Transportation Command ATTN: TCJ3/4 Scott AFB, IL 62225-7001
B.	MTMC, HQ Plans	COM-703-756-1562 DSN-289-1562	Commander Military Traffic Management Command 5611 Columbia Pike Falls Church, VA 22041-5050
C.	MTMCTEA OAT	DSN-927-5269,or COM-804-599-1111	Director Military Traffic Management Transportation Engineering Agency 720 Thimble Shoals Blvd Suite 130 Newport News, VA 23606-2574
D.	MTMC EA Operations	COM-201-823-5906 DSN-247-5906	Commander Military Traffic Management Command, Eastern Area Bayonne, NJ 07002-5302
E.	MTMC WA Operations	COM-510-466-3322 DSN-859-3322	Commander Military Traffic Management Command, Western Area Oakland Army Base Oakland, CA 94626-5000
F.	MSC Operations or Strategic Mobility or MPS, LASH	COM-202-433-0080 DSN-288-0080 COM-202-433-0277 DSN-288-0277 COM-202-433-0097 DSN-288-0097	Commander Military Sealift Command ATTN: M-6, Strategic Mobility Washington Navy Yard Bldg 210 Washington, DC 20398-5100
G.	AMC	COM-618-256-5560 DSN-576-5560	Commander in Chief Air Mobility Command Scott AFB, IL 62225-5000

	ACTIVITY/ OFFICE/CODE	TELEPHONE NUMBER	ADDRESS
H.	MARAD, RRF Suisan Bay CA	COM-707-745-0487	Fleet Superintendent Suisan Bay Reserve Fleet PO Box 318 Venicia, CA 94510
I.	MARAD, RRF James River, VA	COM-804-887-3233	Fleet Superintendent James River Reserve Fleet Drawer "C" Ft Eustis, VA 23604
J.	MARAD, RRF Beaumont	COM-409-722-1240	Fleet Superintendent Beaumont Reserve Fleet PO Box 6355 Beaumont, TX 77705
K.	MARAD, HQ	COM-202-366-1875	US Department of Transportation Maritime Administration Deputy Director of Ship Operations 400 Seventh Street, SW Room 2122 Washington, DC 20590
L.	USACE, Tulsa Inland Waterways	COM-918-669-7549	Army Corps of Engineers Attn: John Sparlin PO Box 61 Tulsa, OK 74121
M.	CNO, N42	COM-703-614-5579 COM-703-695-4008 COM-703-614-1042 DSN-224-5579	Director Office of the CNO (N42) 2000 Navy Pentagon Washington, DC 20350-2000
N.	CMC, LPO-3	COM-703-696-1088 DSN-226-1088/90	Commandant of the Marine Corps HQMC, I & L (LPO-3) 3033 Wilson Blvd, Room 625 Arlington, VA 22201
O.	HQDA (DALO-TSM)	COM-703-614-6608 DSN-224-6608	Commander Department of the Army DCSLOG (Attn: DALO-TSM) Washington, DC 20310-0500
P.	HQUSAF (LGT)	COM-703-695-3153 DSN-225-3153	Headquarters United States Air Force LGT 1030 Air Force Pentagon Washington, DC 20330-1030

APPENDIX I

PORTS FOR NATIONAL DEFENSE, PORT READINESS COMMITTEE POINTS OF CONTACT

PORT	TELEPHONE NUMBER	POINT OF CONTACT
Beaumont, TX	409-723-6513	MSO Port Arthur Capt J. L. Richardson
Charleston, SC	803-724-7683	MSO Charleston Capt R. E. Bennis
Hampton Roads, VA	804-441-3302	MSO Hampton Roads Capt G. J. Thronton
Houston, TX	713-671-5170	MSO Houston Capt A. C. Alejandro
Jacksonville, FL	904-232-2640	MSO Jacksonville Capt J. P. Wysocki
LA/Long Beach, CA	810-980-4430	MSO Long Beach Capt J. B. Morris
New York, NY/ New Jersey	212-668-7917	MSO New York Capt R. M. Larrabee
Puget Sound, WA	206-286-5550	MSO Puget Sound Capt R. D. Mowrey
San Francisco, CA	510-437-3137	MSO San Francisco Capt J. M. MacDonald
Savannah, GA	912-652-4371 912-652-4353	MSO Savannah CDR M. H. Johnson
Wilmington, NC	919-343-3302	MSO Wilmington Capt C. F. Eisenbeis

APPENDIX J

US FLAG MILITARILY USEFUL DRY CARGO SHIPS

SHIP TYPE	HULL DESIGN	SHIP NAME	SHIP DWT
** BARGE			
BARGE	C8-S-81B	AMERICAN VETERAN	30298
BARGE	C8-S-81B	AUSTRAL RAINBOW	30223
BARGE	C8-S-81B	CAPE FEAR	30298
BARGE	C8-S-81B	CAPE FLORIDA	30298
BARGE	C8-S-81H	AMERICAN KESTREL	30298
BARGE	C8-S-81H	LASH ATLANTICO	30298
BARGE	C8-S-82A	CAPE MAY	39026
BARGE	C8-S-82A	CAPE MENDOCINO	39026
BARGE	C8-S-82A	CAPE MOHICAN	39026
BARGE	C9-S-81D	CAPE FAREWELL	41363
BARGE	C9-S-81D	CAPE FLATTERY	41363
BARGE	C9-S-81D	GREEN HARBOUR	46892
BARGE	C9-S-81D	GREEN ISLAND	46892
BARGE	C9-S-81D	GREEN VALLEY	46152
BARGE	C9-S-81D	ROBERT E. LEE	41578
BARGE	C9-S-81D	SAM HOUSTON	41578
BARGE	C9-S-81D	STONEWALL JACKSON	41578
** BREAKBULK			
BREAKBULK	C3-M-PVT062	GREEN RIDGE	12487
BREAKBULK	C3-M-PVT062	GREEN WAVE	13130
BREAKBULK	C3-S-33A	CAPE CATAWBA	12666
BREAKBULK	C3-S-33A	LAKE	12461
BREAKBULK	C3-S-33A	MORMACGLEN	12590
BREAKBULK	C3-S-33A	NORTHERN LIGHT	12738
BREAKBULK	C3-S-33A	PRIDE	12601
BREAKBULK	C3-S-33A	SCAN	12683
BREAKBULK	C3-S-33A	SOUTHERN CROSS	12718
BREAKBULK	C3-S-37C	CAPE CANAVERAL	12887
BREAKBULK	C3-S-37C	CAPE CANSO	12887
BREAKBULK	C3-S-37C	CAPE CARTHAGE	12824
BREAKBULK	C3-S-37C	CAPE CATOCHE	12887
BREAKBULK	C3-S-37C	CAPE CHALMERS	11473
BREAKBULK	C3-S-37C	CAPE CHARLES	12887
BREAKBULK	C3-S-37C	CAPE CLEAR	12824
BREAKBULK	C3-S-37C	CAPE COD	12824
BREAKBULK	C3-S-37D	GULF BANKER	11549
BREAKBULK	C3-S-37D	GULF FARMER	11549
BREAKBULK	C3-S-37D	GULF MERCHANT	11550
BREAKBULK	C3-S-37D	GULF SHIPPER	11550
BREAKBULK	C3-S-37D	GULF TRADER	11550
BREAKBULK	C3-S-38A	ADVENTURER	10965
BREAKBULK	C3-S-38A	AGENT	11267
BREAKBULK	C3-S-38A	AIDE	11198
BREAKBULK	C3-S-38A	AMBASSADOR	11197
BREAKBULK	C3-S-46A	BANNER	12832

SHIP TYPE	HULL DESIGN	SHIP NAME	SHIP DWT
BREAKBULK	C3-S-46A	BAY	12832
BREAKBULK	C3-S-46A	BUILDER	12832
BREAKBULK	C3-S-46A	BUYER	12832
BREAKBULK	C3-S-76A	DEL MONTE	13248
BREAKBULK	C3-S-76A	DEL VALLE	13248
BREAKBULK	C3-S-76A	DEL VIENTO	13248
BREAKBULK	C4-A-66A	GALVESTON BAY	14897
BREAKBULK	C4-S-1U	CAPE JACOB	14579
BREAKBULK	C4-S-1U	CAPE JOHN	14607
BREAKBULK	C4-S-1U	CAPE JOHNSON	14699
BREAKBULK	C4-S-1U	CAPE JUBY	14699
BREAKBULK	C4-S-1U	MORMACWAVE	14591
BREAKBULK	C4-S-57A	PIONEER COMMANDER	13752
BREAKBULK	C4-S-57A	PIONEER CONTRACTOR	13752
BREAKBULK	C4-S-57A	PIONEER CRUSADER	13757
BREAKBULK	C4-S-58A	CAPE ALAVA	12932
BREAKBULK	C4-S-58A	CAPE ALEXANDER	12932
BREAKBULK	C4-S-58A	CAPE ANN	12932
BREAKBULK	C4-S-58A	CAPE ARCHWAY	12932
BREAKBULK	C4-S-58A	CAPE AVINOF	12932
BREAKBULK	C4-S-58A	DAWN	12932
BREAKBULK	C4-S-66A	CAPE BLANCO	14897
BREAKBULK	C4-S-66A	CAPE BON	14897
BREAKBULK	C4-S-66A	CAPE BORDA	14897
BREAKBULK	C4-S-66A	CAPE BORDA	14897
BREAKBULK	C4-S-66A	CAPE BOVER	14897
BREAKBULK	C4-S-66A	CAPE BRETON	14897
BREAKBULK	C4-S-66A	ELIZABETH LYKES	14897
BREAKBULK	C4-S-66A	GENEVIEVE LYKES	14897
BREAKBULK	C4-S-66A	LETITIA LYKES	14897
BREAKBULK	C4-S-66A	LOUISE LYKES	14897
BREAKBULK	C4-S-66A	RUTH LYKES	14897
BREAKBULK	C4-S-66A	TAMPA BAY	14897
BREAKBULK	C5-S-75A	CAPE GIBSON	22564
BREAKBULK	C5-S-75A	CAPE GIRARDEAU	22564
BREAKBULK	C5-S-75A	CLEVELAND	22536
BREAKBULK	C5-S-75A	STELLA LYKES	22630
BREAKBULK	C5-S-75A	SUE LYKES	22564
** CONT BB20			
CONT BB20	C3-S-46B	COURIER	12909
CONT BB20	C3-S-46B	EXPORT CHALLENGER	12726
CONT BB20	C3-S-46B	EXPORT CHAMPION	12726
CONT BB20	C3-S-46B	EXPORT COMMERCE	12726
CONT BB20	C5-S-37E	FRED G	14530
CONT BB20	C5-S-37E	JAMES LYKES	14530
CONT BB20	C5-S-37E	JEAN LYKES	14530

SHIP TYPE	HULL DESIGN	SHIP NAME	SHIP DWT
CONT BB20	C5-S-37E	JOHN LYKES	14530
CONT BB20	C5-S-37E	LESLIE LYKES	14759
CONT BB20	C5-S-37E	SOLON TURMAN	14759
CONT BB20	C5-S-37E	THOMPSON LYKES	14515
CONT BB20	C5-S-37F	ASHLEY LYKES	14515
CONT BB20	C5-S-37F	BRINTON LYKES	14515
CONT BB20	C5-S-37F	MARJORIE LYKES	11684
CONT BB20	C5-S-37F	SHIRLEY LYKES	14526
CONT BB20	C6-S-60C	ALLISON LYKES	12968
CONT BB20	C6-S-60C	CORPUS CHRISTI	15244
CONT BB20	C6-S-60C	MAGALLANES	15244
CONT BB20	C6-S-60C	MALLORY LYKES	15244
** CONT MOD			
CONT MOD	C7-S-88A	SEA-LAND CONSUMER	25730
** CONT MOD-P			
CONT MOD-P	C5-S-73B	EXPORT FREEDOM	16605
CONT MOD-P	C5-S-73B	EXPORT PATRIOT	16605
CONT MOD-P	C8-S-85C	SEA-LAND NAVIGATOR	28200
CONT MOD-P	C8-S-85C	SEA-LAND TRADER	31495
** CONT NSS20			
CONT NSS20	C5-S-73B	ARGONAUT	16401
CONT NSS20	C5-S-73B	RESOLUTE	16205
CONT NSS20	C6-M-F147A	MARGARET LYKES	15400
** CONT NSS40			
CONT NSS40	C4-S-66A	GALVESTON BAY	58943
CONT NSS40	C6-M-F146A	TILLIE LYKES	36003
CONT NSS40	C6-M-F146A	TYSON LYKES	36003
CONT NSS40	C6-M-F147A	ADABELLE LYKES	15400
CONT NSS40	C6-M-F147A	CHARLOTTE LYKES	19650
CONT NSS40	C6-M-F147A	SHELDON LYKES	15400
CONT NSS40	C6-S-85A	SEA-LAND EXPEDITION	19845
CONT NSS40	C6-S-85A	SEA-LAND HAWAII	19842
CONT NSS40	C6-S-85B	HOWELL LYKES	18832
CONT NSS40	C6-S-85B	JEAN LYKES	18832
CONT NSS40	C6-S-85B	PRESIDENT JEFFERSON	20718
CONT NSS40	C6-S-85B	THOMPSON LYKES	18832
CONT NSS40	C7-S-68C	HUMACAO	22582
CONT NSS40	C7-S-68C	SEA-LAND CHALLENGER	22493
CONT NSS40	C7-S-68D	MAYAGUEZ	20904
CONT NSS40	C7-S-68D	SEA-LAND CRUSADER	20904
CONT NSS40	C7-S-68D	SEA-LAND DISCOVERY	22013
CONT NSS40	C7-S-68E	CAROLINA	20428
CONT NSS40	C7-S-68E	GUAYAMA	20904

SHIP TYPE	HULL DESIGN	SHIP NAME	SHIP DWT
CONT NSS40	C7-S-68E	NUEVO SAN JUAN	20336
CONT NSS40	C8-S-F81E	PRESIDENT GRANT	37346
CONT NSS40	C8-S-F81E	PRESIDENT HARRISON	30226
CONT NSS40	C8-S-F81E	PRESIDENT HOOVER	38656
CONT NSS40	C8-S-F81E	PRESIDENT TYLER	38656
CONT NSS40	C9-M-132B	PRESIDENT LINCOLN	30825
CONT NSS40	C9-M-132B	PRESIDENT MONROE	30825
CONT NSS40	C9-M-132B	PRESIDENT WASHINGTON	30825
CONT NSS40	C9-M-F141A	CGM ILE DE FRANCE	58869
CONT NSS40	C9-M-F141A	NEDLLOYD HOLLAND	58943
CONT NSS40	C9-M-F141A	NEDLLOYD HUDSON	58943
CONT NSS40	C9-M-F141A	NEWARK BAY	58869
CONT NSS40	C9-M-F141A	RALEIGH BAY	58443
CONT NSS40	C9-M-F141A	SEA-LAND ACHIEVER	58943
CONT NSS40	C9-M-F141A	SEA-LAND ATLANTIC	58943
CONT NSS40	C9-M-F141A	SEA-LAND INTEGRITY	58943
CONT NSS40	C9-M-F141A	SEA-LAND PERFORMANCE	58869
CONT NSS40	C9-M-F141A	SEA-LAND PRODUCER	25730
CONT NSS40	C9-M-F141A	SEA-LAND QUALITY	58869
CONT NSS40	C9-M-F141A	SEA-LAND VALUE	58943
CONT NSS40	C9-M-F148A	PRESIDENT EISENHOWER	47841
CONT NSS40	C9-M-F148A	PRESIDENT F. D. ROOSEVELT	47841
CONT NSS40	C9-M-F151A	PRESIDENT ARTHUR	44966
CONT NSS40	C9-M-F151A	PRESIDENT BUCHANAN	44966
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